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PRIMARY ARITHMETIC

BY

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COLUMBIA UNIVERSITY, NEW YORK

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PREFACE

The following ideas have been prominent in the preparation of this book :

1. In sequence of topics, to follow as closely as possible such of the recent courses of study as have been the most carefully prepared for our public-school systems. However an author may feel as to details, he is in the main bound by the consensus of opinion as thus expressed. The purely "topical method," the attempt to exhaust a subject like common fractions in a single chapter, is now obsolete in our leading schools, while the extreme "spiral method" is scrappy, uninteresting, and lacking in the continuity so essential to thoroughness. Between these two comes the best type of our modern courses of study, somewhat spiral in arrangement, in that most subjects extend over several terms, but admitting of a topical arrangement within any one term, thus securing thoroughness and maintaining an interest.

2. In arrangement by grades, to offer merely a tentative plan easily modified to suit local conditions. Schools cannot all be graded alike, but it will assist teachers to know that the successive chapters represent the average work of the first four school years. Teachers are advised to introduce the book at the middle of the second year, reviewing the first chapter and a half as may be necessary.

3. In the selection of problems, to replace the artificial ones, against which teachers have so long protested, by those which appeal to the interests and needs of children in the primary grades. An attempt has also been made so to group these problems as to emphasize their richness of content in relation to life. At the same time there is offered an abundance of that oral and written drill which is necessary for fixing number facts in the mind; the former, of course, being merely suggestive of the best of all oral work, that which appears to come spontaneously from the teacher. Supplementary drill work will be found on page 266.

4. In the matter of method, to recognize the valuable features of the best contributions, avoiding their extremes. For example, there should always be some attention to a spiral arrangement, but its extreme is unscientific and uninteresting. The ratio idea in fractions has much to commend it, but its extreme is unnatural and unbusinesslike. The actual measuring of things is valuable, but that, like paper cutting and folding, may be carried beyond reasonable bounds.

5. In the matter of illustrations, to recognize the legitimate use of pictures for the following purposes: To show the relations of numbers, to make real their use in measurements, to suggest materials for the use of the teacher, to render more interesting and genuine the various groups of problems, and incidentally to present a page that shall attract children without allowing the book to become a mere collection of pictures.

DAVID EUGENE SMITH,

February, 1904.

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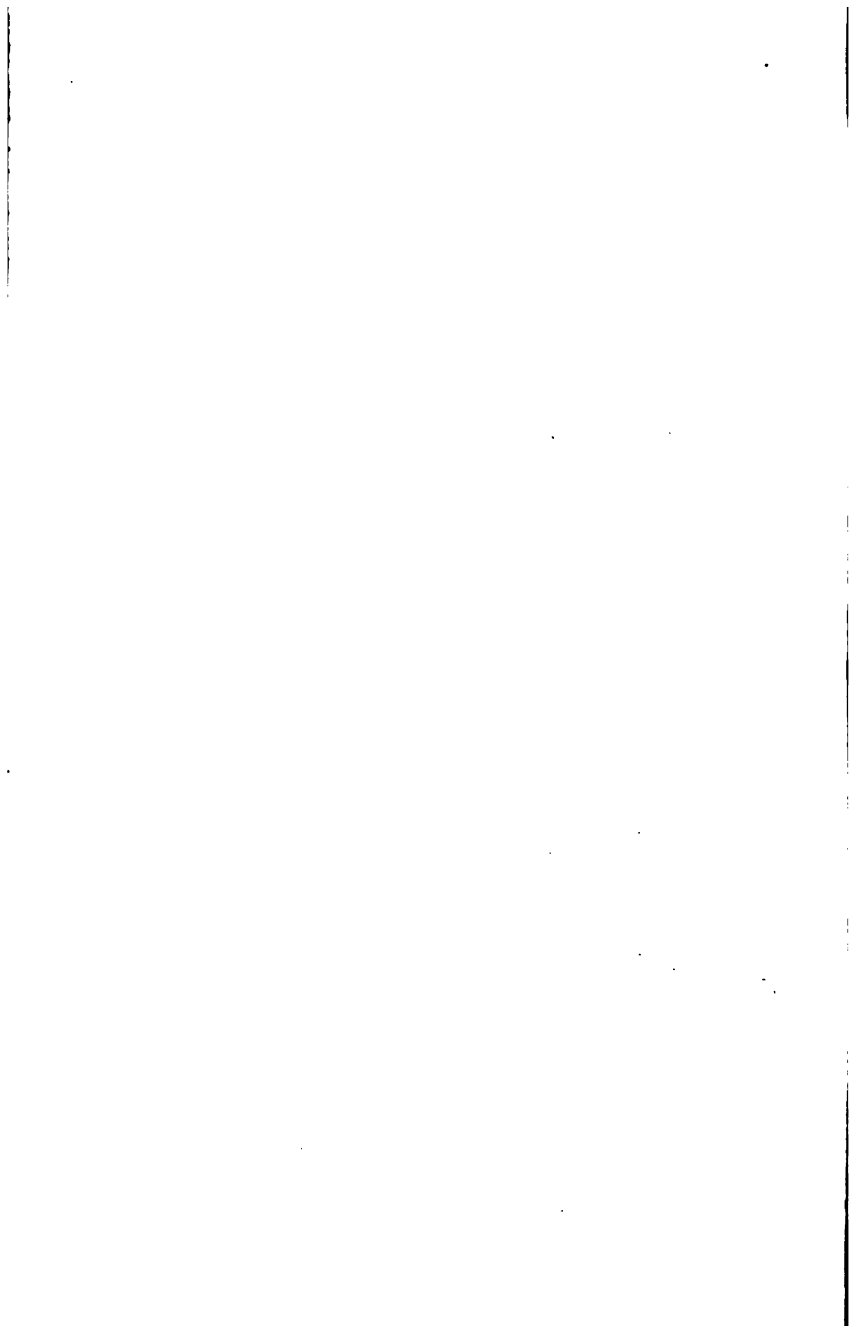
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PRIMARY ARITHMETIC

CHAPTER I

REVIEW OF NUMBERS TO 12

COUNTING

You already know a good deal about numbers. You learned to count a little before you came to school, and you have learned much more since that time. Perhaps every one in your class can count to a hundred. How far can you count?

You know about buying things and paying for them, and perhaps you have a bank with some money in it.

One of the first things you learned about numbers was counting. You learned:

<i>Figures</i>	0	1	2	3	4	5	6
<i>Names</i>	naught	one	two	three	four	five	six
<i>Objects</i>		•	••	•••	••••	•••••	••••••
<i>Figures</i>	7	8	9	10	11	12	
<i>Names</i>	seven	eight	nine	ten	eleven	twelve	
<i>Objects</i>	••••• •••••	••••• •••••	••••• •••••	••••• •••••	••••• •••••	••••• •••••	••••• •••••

**ORAL EXERCISE**

1. How many children are there in the picture?
2. If there were one more, how many would there be?
3. If there were three less, how many would there be?
4. How many are at the right of the book? How many are at the left?
5. How many more are seated in your row to-day than in the picture?
6. Write your name on the blackboard and count the letters.
7. How many boys are there in your class? How many girls?
8. How many words are there in this line? in the first line of Ex. 9?
9. Close your eyes and hear me tap the desk. How many taps did you hear?

ORAL EXERCISE

1. Close your eyes and tell by feeling how many pieces of crayon I have in my hand.

2. If you call the front desk the first, and the next the second, and so on, what is the last one?

3. How many days make a week? Sunday being the first, what is the number of this day?

4. Copy these pictures on the blackboard and then rapidly tell, without counting, the number of dots in each group:



5. Copy these figures on the blackboard and read them rapidly:

4 7 9 3 6 2 5 8

The teacher should daily give abundant oral drill of the kind suggested on the first few pages. Let there be no day without oral drill, using objects only as necessary. Cards prepared by the children, showing groups as in Ex. 4, are valuable for drill.

WRITTEN EXERCISE

1. Copy these pictures and write the figures below them:



2. Make pictures with dots or lines to show 5, 7, 6, 3, 9, 4.

ORAL EXERCISE

1. What measure is Will using to find how long the blackboard is?



2. What one is Mary using to find the height of the blackboard?

3. How many feet long is the yardstick? Measure it and see.

4. Measure the length of your own blackboard in feet; in yards.

5. How many feet do you think the chalk rack is from the floor? Measure and see.

6. How many inches long is the crayon box? Measure it and see.

7. How much longer is the crayon box than it is wide?

8. Do you know how many feet tall you are? Measure and see. This is how much more than a yard?

9. Draw on the blackboard a line that you think is a foot long. Then measure it and see if you are right.

ORAL EXERCISE

1. How many inches wide is the window pane?
2. How many feet long is your desk, and how many inches over?
3. How many feet and inches from the floor to the bottom of the blackboard?
4. Stepping as you usually do in walking, find how many paces in the length of the room.
5. How many paces wide do you think the room is? Pace the width and see if you are right.
6. How tall did you find you were? How many feet, and how many inches over?
7. How many inches from the lower left-hand corner of this page to the upper right-hand corner?
8. How wide do you think the door is? Measure. How many feet, and how many inches over?

WRITTEN EXERCISE

1. Draw on your paper a picture like this, only larger. Write in the squares all of the figures from 1 to 10.

1	2								10
---	---	--	--	--	--	--	--	--	----

2. Draw on paper a line 3 inches long. Draw two other lines, one of them 1 inch longer than the first, and the other 1 inch shorter.

What interests the children should largely determine the nature of the measurements to be made by the class.

ADDITION

ORAL EXERCISE

1. Count to twelve. What number do you add each time?

2. State rapidly these sums:

1	2	3	4	5	6	7	8	9	10
<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>

3. Count to twelve by 2's: 2, 4, 6, and so on.

4. State rapidly these sums:

1	2	3	4	5	6	7	8	9	10
<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

The sum of 3 and 4 is also written $3 + 4 = 7$. The sign $+$ means *and*; it is also called *plus*. The sign $=$ means *equals*. The *sum* of 3 and 4 is 7.

The teacher will find sets of cards, each having a combination like those in Exs. 2, 4, useful for drill, enlarging the set as the class proceeds.

But little written work should be given at first, and pupils should be required to do this quickly. Loitering brings both inaccuracy and lack of interest.

WRITTEN EXERCISE

Copy the following and write the sum, thus:
 $3 + 5 = 8$.

1. $2 + 1$. 2. $2 + 3$. 3. $2 + 5$. 4. $7 + 2$. 5. $6 + 1$.
 6. $3 + 2$. 7. $2 + 5$. 8. $3 + 3$. 9. $4 + 1$. 10. $4 + 2$.

ORAL EXERCISE

SOME OF YOUR PURCHASES

1. How much do two 2-cent stamps cost?
2. How much do three 2-cent stamps cost?
3. Alice paid 4 cents for a pencil and 5 cents for a pad of paper. How much did both cost?

You have now found that

$$2 = 1 + 1$$

$$3 = 1 + 2 = 2 + 1$$

$$4 = 1 + 3 = 2 + 2 = 3 + 1$$

$$5 = 1 + 4 = 2 + 3 = 3 + 2 = 4 + 1$$

$$6 = 1 + 5 = 2 + 4 = 3 + 3 = 4 + 2 = 5 + 1$$

$$7 = 1 + 6 = 2 + 5 = 3 + 4 = 4 + 3 = 5 + 2 = 6 + 1$$

$$8 = 1 + 7 = 2 + 6 = 3 + 5 = 4 + 4 = 5 + 3 = 6 + 2 = 7 + 1$$

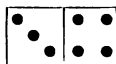
$$9 = 1 + 8 = 2 + 7 = 3 + 6 = 4 + 5 = 5 + 4 = 6 + 3 = 7 + 2 = 8 + 1$$

$$10 = 1 + 9 = 2 + 8 = 3 + 7 = 4 + 6 = 5 + 5 = 6 + 4 = 7 + 3 = 8 + 2 = 9 + 1.$$

A little rapid oral drill on this table and the subtraction table on page 14 should form part of the daily exercise of the class. Cards are helpful, as suggested on page 6.

WRITTEN EXERCISE

Make pictures like this, showing the following sums. Write the answers.



$$3 + 4 = 7$$

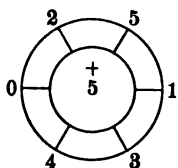
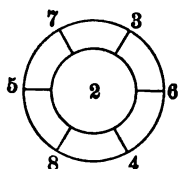
1. $2 + 5$. 2. $6 + 0$. 3. $4 + 2$. 4. $3 + 5$. 5. $5 + 5$.

ORAL EXERCISE

1. If you had 6 marbles, and I gave you 2 more, and you found another, how many would you have?

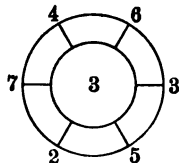
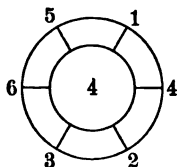
2. Rob's pets are 2 rabbits, a dog, and 2 cats. How many pets has he?

3. See how rapidly you can tell the sums of the



inner and outer numbers. State only the sums.

These figures should be placed on the board by the teacher.



4. Tell these sums as quickly as you can, going around each wheel both ways.

5. If Clara's dog Jack was 2 months old when she bought him, and she has had him 8 months, how old is he now?

Accustom the pupils to read combinations as they read words. When they see the word *one* they do not stop to spell it, *o, n, e*. They look at it and say "one." So when they see this column of figures they should say "eight," not stopping to say "3 and 5 are 8."

5
3

6. State the sums at once without naming the numbers added:

4	6	5	5	2	2	3	2	4	2	3	5
<u>4</u>	<u>4</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>1</u>	<u>8</u>	<u>6</u>	<u>1</u>

ORAL EXERCISE

1. State rapidly these sums:

2	3	4	5	6	7	8	9
<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>

2. State rapidly these sums, giving only the answers without naming the numbers:

4	5	6	7	8
<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>

3. I am thinking of two numbers whose sum is 7; they are not 6 and 1; what may they be?

4. Write these numbers on the blackboard and tell the sums as I point to the numbers:

1	3	2	7	6	3	5	9
<u>4</u>	<u>2</u>	<u>5</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>1</u>

5. Show a part of the ruler that is 3 inches long. Add an inch. Now how long is the part? Point to the sum of 3 inches and 2 inches.

WRITTEN EXERCISE

Measure and write the following lengths in inches:

1. Length of your pencil.
2. Width and length of your paper.
3. Width and length of your reading book.

Work in making paper boxes and envelopes, from measurement, is also valuable, furnishing to children an interesting motive.

ORAL EXERCISE

1. In these examples in addition, look at one set at a time, close your eyes and tell the missing number:

$$\begin{array}{r} 5 \quad 2 \quad * \quad 3 \quad 5 \quad * \quad 5 \quad 4 \quad * \\ \underline{2} \quad \underline{*} \quad \underline{7} \quad \underline{4} \quad \underline{*} \quad \underline{6} \quad \underline{3} \quad \underline{*} \quad \underline{5} \\ * \quad 6 \quad 9 \quad * \quad 8 \quad 9 \quad * \quad 5 \quad 9 \end{array}$$

2. Look carefully at these numbers, one set at a time. Then close your eyes and think of them, telling each time the missing number:

$$5 + * = 8 \quad 6 + * = 7 \quad * + 2 = 6 \quad * + 5 = 9$$

3. State the results of the following:

$$\begin{array}{r} 5 \quad 7 \quad 8 \quad 6 \quad 5 \quad 2 \quad 1 \\ + 2 \quad + 1 \quad + 1 \quad + 3 \quad + 3 \quad + 6 \quad + 7 \end{array}$$

4. If Mary has 3 cents, and Helen has 4 cents, and Bessie has 2 cents, how much have they together?

Uniting two or more numbers into one number is called *addition*. The result is called the *sum*.

WRITTEN EXERCISE

Copy the following and write the sums:

- | | | | |
|-------------|----------|----------|----------|
| 1. $4 + 3,$ | $2 + 5,$ | $6 + 1,$ | $3 + 4.$ |
| 2. $6 + 2,$ | $5 + 3,$ | $1 + 7,$ | $4 + 4.$ |
| 3. $3 + 3,$ | $5 + 1,$ | $2 + 4$ | $1 + 5.$ |

SUBTRACTION

ORAL EXERCISE

1. How many blocks has Helen taken from the 7 blocks?

2. After taking these away, how many blocks are left?

3. If from the 7 blocks she took away 4 blocks, how many would be left?

4. How many are 4 blocks and 3 blocks? 3 blocks and 4 blocks?

5. How many are 7 blocks less 2 blocks? 7 blocks less 5 blocks?

6. How many are 6 blocks and 1 block? 1 block and 6 blocks?

7. How many are 3 blocks and 2 blocks? How many more will make 7?

We read $7 - 3$, "seven less three," or "seven *minus* three." To take one number from another is called *subtraction*. The result is called the *difference*.

8. How many more blocks would Helen need, to have 9? 10?

9. How many blocks should she take from the 7 blocks to have 2 left?



ORAL EXERCISE

1. How many are 6 marbles less 4 marbles? 4 marbles and 2 marbles?

2. How many are 8 inches less 5 inches? 5 inches and 3 inches? 3 inches and 5 inches?

3. How many are 9 children less 4 children? 9 children less 5 children? 5 children and 4 children?

4. Close your eyes and think of $6 + 3 = 9$. Then think of $6 + * = 9$, and tell the missing number.

5. Close your eyes and think of these numbers. Then think of them, and tell the missing number.

$$\begin{array}{r} 4 \\ 5 \\ \hline 9 \end{array} \quad \begin{array}{r} 4 \\ * \\ \hline 9 \end{array}$$

6. State the results of the following:

$$\begin{array}{r} 7 \\ -2 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ -1 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ -1 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ -3 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ -3 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ -6 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ -7 \\ \hline \end{array}$$

The teacher should give abundant oral work of this kind, leading the children to visualize the numbers as groups and their representation by figures.

As may be necessary in this review, the teacher may use splints, blocks, or number cards or drawings of this nature:

$$\bullet\bullet + \bullet\bullet = \bullet\bullet\bullet\bullet \quad \text{therefore} \quad \bullet\bullet\bullet\bullet - \bullet\bullet = \bullet\bullet$$

$$4 + 3 = 7 \quad \quad \quad " \quad \quad \quad 7 - 4 = 3$$

If you buy a 3-cent pencil and give the dealer 5 cents, he says to himself "3 and 2 are 5," and he gives you 2 cents in change. He subtracts 3 from 5 by thinking of adding 2 and 3, because this is easier.

ORAL EXERCISE

1. Jennie is buying apples from Kate at 1 cent each. If she buys 2 apples, and gives Kate 10 cents, how much change should she get?

2. If she buys 5 cents' worth of candy, how much change should she get if she pays Kate 10 cents?

3. How much money should she pay Kate for 2 popcorn balls at 2 cents each? What change should she get if she gives Kate a 5-cent piece?



4. If Jennie buys 2 apples at 1 cent each, and 5 cents' worth of candy, and 4 cents' worth of popcorn balls, how much will she pay for all?

5. Kate sells lemonade at 3 cents a glass. Jennie gives her 5 cents. How much change should she get?

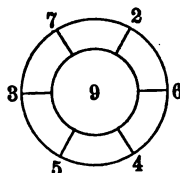
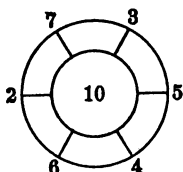
WRITTEN EXERCISE

Copy the following and write the answers:

6	8	6	7	3	4	5
<u>- 4</u>	<u>- 5</u>	<u>- 2</u>	<u>- 1</u>	. <u>- 1</u>	<u>- 2</u>	<u>- 3</u>

ORAL EXERCISE

1. How much change should you get if you buy a 4-cent pencil and give the merchant 5 cents?



2. See how rapidly you can tell the

differences of the inner and outer numbers. State only the differences.

3. State rapidly the following differences:

10	10	10	10	10	10	10	10
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
9	9	9	9	9	9	9	9
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
8	8	8	8	8	8	8	
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	
7	7	7	7	7	7		
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>		
6	6	6	6	6			
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>			
5	5	5	5				
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>				
4	4	4					
<u>1</u>	<u>2</u>	<u>3</u>					
3	3						
<u>1</u>	<u>2</u>						
2							
<u>1</u>							

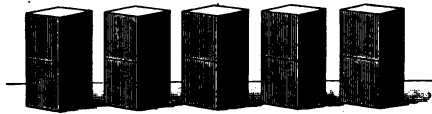
The circles in Ex. 2 should be placed on the blackboard.

Ex. 1 furnishes a valuable type for drill work.

This table of differences must be memorized. Change the regular order of numbers in reviews.

In general the teacher should drill on column work chiefly, this being the form which pupils need to visualize, but the circle drill furnishes a variety.

MULTIPLICATION



ORAL EXERCISE

1. How many cubes are there in each pile? 2
2. Count them rapidly by 2's, thus: 2 2 2
2, 4, 6, and so on. 2 2 2 2
3. Tell the number of 2's in each 2 2 2 2 2
of these columns, and the sum. 3
4. Count rapidly by 3's from 3 to 3 3
12. Tell the number of 3's in each 3 3 3
of these columns, and the sum. 3 3 3 3
5. Here are two 4's, and also • • • • = 4
four 2's. What does this tell you • • • • = 4
about 2 times 4 and 4 times 2? 2 + 2 + 2 + 2 = 8

The object at this time is merely to give an idea of multiplication as growing out of addition.

WRITTEN EXERCISE

Copy the following and write the answers:

1. $2 + 2 + 2,$ $3 + 3,$
3 times 2, 2 times 3.
2. $2 + 2 + 2 + 2,$ $4 + 4,$
4 times 2, 2 times 4.

ORAL EXERCISE

SOME OF YOUR PURCHASES

1. How much will three 2-cent stamps cost?
2. At 5 cents each, how much will 2 oranges cost?
3. At 3 cents a pint, how much will 3 pints of milk cost?
4. At 2 cents a yard, how much will 4 yards of ribbon for some badges cost?
5. A nickel is 5 cents. How many cents are there in 2 nickels?
6. A dime is 10 cents. This is how many times 5 cents? Then a dime equals how many nickels?

We may write 2 times 3 cents either 2×3 cents or $3 \text{ cents} \times 2$.

*Some teachers use one, some the other. In this book the work in general allows for either reading. To avoid confusing children, one form should be adopted and followed. The second form is preferably read, "3 cents multiplied by 2."

WRITTEN EXERCISE

1. Copy and multiply:

$$1 \times 2 \qquad 2 \times 2 \qquad 3 \times 2 \qquad 4 \times 1$$

2. Draw a picture of a square 1 inch on a side. This is a square inch.

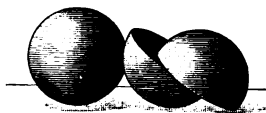
3. Draw a picture of a square 2 inches on a side. Divide it into square inches. How many square inches does it contain?

PARTS OF ONE OBJECT

ORAL EXERCISE

1. Into how many equal parts has this sphere been divided? Each is what part of the sphere?

2. If the sphere weighs 1 pound, how much does half of it weigh?



3. How much is half of the sphere and half of the sphere? How much is half of a foot and half of a foot?

One half is written like this: $\frac{1}{2}$.

We write two halves like this: $\frac{2}{2}$.

If we cover a half sphere in the picture, we leave a sphere and a half. One and one half is written $1\frac{1}{2}$.

No abstract seat work in number should be given until the pupil can do it without mistake. Premature work of this kind results in habits of inaccuracy. All written work should, therefore, be modified as necessary for individual cases. Teachers should give abundant practice on halves, using drawings, paper folding and cutting, and other objective work.

WRITTEN EXERCISE

1. Write in figures: two and a half.

2. Copy and add:

$$\frac{1}{2} + \frac{1}{2}$$

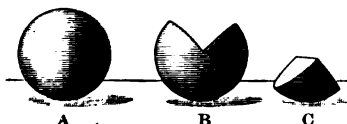
$$1\frac{1}{2} + \frac{1}{2}$$

$$1 + \frac{1}{2}$$

3. Write in figures, with the answers: Two halves are how many? Four halves are how many?

ORAL EXERCISE

1. What part of the sphere is C ?
2. B is how many times as large as C ?



3. If you write one half $\frac{1}{2}$, how should you write one fourth? one third?

4. If you put two fourths of a sphere together, what part will you have?

5. Add $\frac{1}{2}$ of a sphere and $\frac{1}{2}$ of a sphere; $\frac{1}{2}$ of a sphere, $\frac{1}{4}$ of a sphere, and $\frac{1}{4}$ of a sphere.

6. Subtract $\frac{1}{4}$ of a sphere from $\frac{1}{2}$ of a sphere.

The above is suggestive of a large amount of rapid oral drill with various objects. Paper cutting or folding may be employed to advantage in this connection. For example, strips of paper may be cut by the children into 1-foot lengths, folded to get the $\frac{1}{2}$ -foot, and again to get the $\frac{1}{4}$ -foot, the number of inches being found by measuring.

You have now seen that

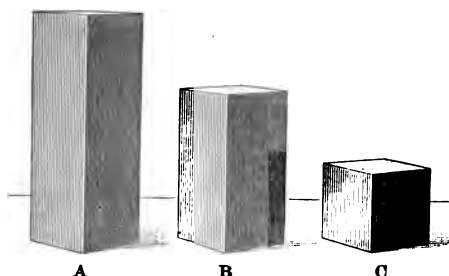
$$\frac{1}{2} + \frac{1}{2} = \frac{2}{2}, \text{ and that } \frac{2}{2} = 1;$$

$$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}, \text{ and that } \frac{2}{4} = \frac{1}{2}.$$

One fourth is also called a *quarter*.

WRITTEN EXERCISE

1. Draw a line 4 inches long and divide it into fourths.
2. Draw another line the same length, making $\frac{1}{2}$ of it heavier than the rest.



ORAL EXERCISE

1. Block B is how many times as large as C?
Then C equals what part of B?
2. Block A is how many times as large as C?
Then C equals what part of A?
3. If C weighs 1 pound, how much does B weigh?
If B weighs 1 pound, how much does C weigh?
4. If C weighs 1 pound, how much do A and B together weigh?
5. If B weighs 1 pound, how much do A and C together weigh?
6. If C is 1 foot high, how high is A? If B is 1 foot high, how high is C?
7. Is C more or less than half of A? Then which is greater, $\frac{1}{3}$ or $\frac{1}{2}$?

WRITTEN EXERCISE

Copy and complete the following:

1. $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = *$.
2. $\frac{1}{3} - \frac{1}{3} = *$.
3. $1 - \frac{1}{2} = *$.



PARTS OF A GROUP OF OBJECTS

ORAL EXERCISE

1. Here are 6 little rabbits and the mother rabbit. How many little rabbits on each side?

2. Half of 6 rabbits are how many rabbits? How many pairs are half of 6 pairs of ears? How many sets are half of 6 sets of feet?

3. If you separate the six little rabbits into 3 equal groups instead of 2 groups, how many will there be in each group?

4. Then how many are $\frac{1}{3}$ of 6 rabbits? $\frac{1}{3}$ of 6 ears to the right of the mother rabbit? $\frac{1}{3}$ of 6 bright eyes to the left of the mother rabbit?

5. How many is

$\frac{1}{2}$ of 4? $\frac{1}{2}$ of 6? $\frac{1}{2}$ of 8? $\frac{1}{2}$ of 10? $\frac{1}{3}$ of 6? $\frac{1}{3}$ of 9?

||| |||| ||||| ||||| ||||| ||||| ||||| |||||

We find $\frac{1}{2}$ of a number by dividing it into 2 equal parts. So we find $\frac{1}{2}$ of 6 blocks by dividing them into 2 equal groups. We write this, 6 blocks \div 2 = 3 blocks.

6. How many are 10 blocks \div 2? 8 cents \div 2?

FORMS

ORAL EXERCISE

1. This little girl is pointing to the horizon. What lines in the picture are nearly horizontal? Why are they called horizontal?

2. Point to two nearly vertical lines in the picture.

3. If you hang an apple by a string, which of these two kinds of lines will the string show?

4. Point to six vertical lines in the room; to $\frac{1}{3}$ as many horizontal lines.



A Horizontal Line

WRITTEN EXERCISE

1. Draw 8 vertical lines. Cross off $\frac{1}{4}$ of them.

2. Draw 6 horizontal lines, making $\frac{1}{3}$ of them half as long as the rest.

3. Draw vertical lines as in Ex. 5 on page 20, to show $\frac{1}{4}$ of 8.



ORAL EXERCISE

1. Point to a right angle in the room ; on your desk.

2. Draw on the blackboard a vertical line. Draw a horizontal line that meets it. What kind of an angle is made?

3. Draw an oblong on the blackboard. How many angles are there in the oblong? What kind of an angle is each one?

4. Draw a square on the blackboard. How many sides has the square? How many right angles? What can you tell about the sides?

PAPER FOLDING

Schools that introduce paper folding or cutting will find this subject of value at this time.

1. Fold or cut an oblong that is half as high as it is long.

2. Fold or cut one that is three times as long as it is high.

3. Fold or cut one that is 2 inches long and $\frac{1}{4}$ as high.

4. Fold one that is 4 inches high and $\frac{1}{2}$ as long.

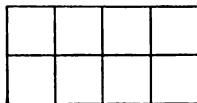
5. Fold a square 2 inches on a side. Divide this into four squares by two folds of the paper.

6. Fold or cut an oblong 4 inches long and 3 inches high. Fold so as to divide this into small squares 1 inch on a side.

ORAL EXERCISE

1. Point to $\frac{1}{4}$ of these squares. How many squares are $\frac{1}{4}$ of 8 squares?

2. Show that $\frac{1}{2}$ of the oblong equals 2 fourths, and that 4 fourths of the oblong is the whole.



3. How many are $\frac{1}{2}$ of 8 squares? Point to them in two different groups. How many halves make the whole?

The distance around a figure like a square or oblong is called the *perimeter*.

4. Each small square in the picture is $\frac{1}{4}$ inch on a side. How long is the perimeter of the oblong?

WRITTEN EXERCISE

1. Draw a square 2 inches on a side. Divide it into squares each 1 inch on a side. Each small square is what part of the large one?

2. Draw an oblong 1 inch high and 3 inches long. Divide it into squares each 1 inch on a side. Each square is what part of the oblong?

3. If a square is 2 inches on a side, how long is the perimeter? Draw the square and divide it into squares each $\frac{1}{2}$ inch on a side.

4. Draw a square that is 1 inch high, and another that is 2 inches high. The second equals how many times the first? The first equals what part of the second?

ORAL EXERCISE

1. If this prism is 4 inches high and is $\frac{1}{2}$ as thick, how thick is it?



2. If it weighs 3 pounds, how much would it weigh if it were only $\frac{1}{3}$ as high?

3. If it weighs 3 pounds, how much would it weigh if it were twice as high?

4. The ends of these prisms are 1 inch square ;

A is 1 inch long and B is 4 inches long. If we call A *one*, what is B?



If we call B *one*, what is A? If we call A *two*, what is B?

5. If we call cylinder A *one*, what is cylinder B? what is C?

6. If we call cylinder B *one*, what is cylinder A? what is C?



A



B



C

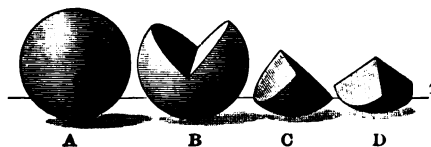
7. If we call cylinder B *two*, what is A? what is C?

8. If we call cylinder C *one*, what is B? what is A?

9. If B weighs 1 pound, how much does A weigh? how much does C weigh?

10. If C weighs 1 pound, how much does B weigh? how much does A weigh?

11. If B is 4 inches high, how high is A? how high is C?



ORAL EXERCISE

1. A is a sphere. C is what part of a sphere?
2. If D is $\frac{1}{2}$ as large as C, what part of a sphere is D?
3. If we call A *four*, what is C?
4. If we call A *eight*, what is C? what is D?
5. Point to $\frac{1}{8}$ of a sphere; to $\frac{1}{4}$ of a sphere; to three times $\frac{1}{4}$ of a sphere.

The above may easily be varied by using parts of any object. Paper cutting and folding are recommended for this work. Enough such oral work should be given to make the pupil entirely familiar with these fractions. Incidentally other fractions may be introduced.

WRITTEN EXERCISE

Copy, and insert the missing numbers:

1. $5 + * = 9$, $6 + * = 9$, $4 + * = 8$, $3 + * = 8$.
2. $2 + * = 10$, $7 + * = 10$, $6 + * = 10$, $4 + * = 10$.
3. $7 - * = 4$, $10 - * = 3$, $9 - * = 5$, $8 - * = 3$.
4. $2 \times * = 4$, 2 times * spheres = 4 spheres, 3 times * spheres = 6 spheres.
5. 2 spheres and 2 spheres and 2 spheres are * spheres.
6. 2 times * of a sphere = 1 sphere, 4 times * of a sphere = 1 sphere, 3 times * of a sphere = 1 sphere.

MEASURES

ORAL EXERCISE

1. How many feet in 1 yard?
2. Measure the length of the room in yards.
3. If a table is 2 yards long, it is how many feet long?
4. How many feet are there in 1 yard and 2 feet? in 3 yards?
5. How many inches are there in 1 foot? in 1 foot less 2 inches?
6. How many feet are 2 feet + 2 feet + 2 feet? How many yards?
7. State quickly the value of each of the following:

6 feet - 4 feet

6 yards - 4 yards

6 inches - 4 inches

2 times 2 inches

2 times 2 yards

2 times 2 feet

$\frac{1}{3}$ of 3 feet

$\frac{1}{4}$ of 8 paces

8. If you are 1 yard and 1 foot tall, how many feet tall are you?
9. If your desk lacks 1 foot of being a yard long, how many feet long is it?

Pupils should have abundant exercise in measuring lines, in comparing lengths, and in finding how much longer one line is than another. Not only should every school be supplied with the common measures, but children should be entirely familiar with them through frequent use.

You have now learned that

$$12 \text{ inches} = 1 \text{ foot.}$$

$$3 \text{ feet} = 1 \text{ yard.}$$

We usually write in. for inch or inches, ft. for foot or feet, yd. for yard or yards, 2 ft. 3 in. for 2 feet and 3 inches.

ORAL EXERCISE

1. 2 ft. + 3 ft. + 6 ft.
2. 3 yd. + 4 yd. + 5 yd.
3. 7 ft. - 3 ft. - 2 ft.
4. 12 in. - 4 in. - 5 in.
5. $\frac{1}{3}$ of 3 yd.
6. $\frac{1}{4}$ of 4 yd.
7. $\frac{1}{5}$ of 5 yd.

WRITTEN EXERCISE

Find the sums in Exs. 1-5:

1. 4	2. 2	3. 1	4. 6	5. 1
2	3	2	1	2
3	1	4	1	2
1	2	1	2	2
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Find the differences in Exs. 6-10:

6. 6	7. 10	8. 7	9. 8	10. 9
2	3	4	5	2
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Copy Exs. 11-14 and write the answers:

11. $\frac{1}{2}$ of 8 blocks.
12. $\frac{1}{2}$ of 6 blocks.
13. $\frac{1}{4}$ of 8 cents.
14. $\frac{1}{3}$ of 6 marbles.
15. Make 10 little stars on your paper and draw a line around half of them. How many is $\frac{1}{2}$ of 10?

ORAL EXERCISE

1. How many cents make a nickel? a dime?
2. Tell me something that cost you a nickel; a dime.
3. How many nickels make a dime? A nickel is what part of a dime?
4. A cent is what part of a nickel? A cent is what part of a dime?
5. How many dimes make a dollar? A dime is what part of a dollar?

You have now learned that

5 cents = 1 nickel.

10 cents = 1 dime.

10 dimes = 1 dollar.

We usually write ct. or ¢ for cent or cents, \$2 for 2 dollars.

Every school should be supplied with toy or real money, and the pupils should be given exercises in buying, selling, and making change. Children should know that a denomination applying to the first number of a column in addition or subtraction, like the ct. in the written exercise below, applies to the numbers that follow.

WRITTEN EXERCISE

Add:

1. 2 ct.	2. 3 ct.	3. 4 ct.	4. 6 ct.	5. 2 ct.
3	1	2	1	2
1	1	1	1	2
<u>4</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>

ORAL EXERCISE

HELEN WEAVES A RUG

1. Helen had 3 skeins of black and 2 of orange wool. How many skeins of wool had she?

2. The wool cost 2 ct. a skein. How much did the orange wool cost? How much did all of the wool cost?

3. She used 3 skeins of black and 1 of orange for this rug. How many skeins had she left?

4. There are 6 in. of black and 2 in. of orange in the rug. How long is the rug?

5. If she wove 2 in. of the rug each day, how many days did it take her to make it?

6. If Helen puts a 1-in. fringe on each end, how much longer will the rug be?

7. If she makes 4 tassels for each end, how many tassels will she make?

8. If she weaves 3 rows of orange in each border, how many will there be in the two borders?

9. If the rug is 10 in. long and 6 in. wide, it is how much longer than wide?



ORAL EXERCISE

1. Which is the pint measure in the picture, and which is the quart?



2. How many pints make a quart? A pint is what part of a quart?

3. Can you tell me several things that are sold by the pint and by the quart? What are they?

4. How much does a quart of milk cost? a pint?
5. If I have a quart of cream and a pint of cream, how many pints do I have?
6. Draw on the blackboard a full-size picture of a quart measure. Draw a line across, marking off 1 pint.

In all oral work, of which this is merely a specimen, the problems should be made to appeal to the children's daily interests as far as possible, and the actual measures should be used.

You have now learned that

$$2 \text{ pints} = 1 \text{ quart.}$$

We usually write pt. for pint or pints, and qt. for quart or quarts.

ORAL EXERCISE

1. The children in the picture have a 2-pound weight and a $\frac{1}{2}$ -pound weight to balance the book. Tell me how much the book weighs.



2. If they should weigh 1 pt. of water, they would find that it weighs a pound. How much does 1 qt. weigh?

3. If one of your books weighs $\frac{1}{2}$ pound, another $\frac{1}{4}$ pound, and another $\frac{1}{4}$ pound, how much do all three weigh?

4. If the children had a pound of figs worth 2 dimes, how much would $\frac{1}{2}$ pound be worth?

5. Multiply the following by 2 and add 1 pound to each result:

1 pound 2 pounds 3 pounds

6. Find $\frac{1}{2}$ of each of the following:

4 pounds 2 pounds 6 pounds

We usually write lb. for pound or pounds.

It is desirable that children should weigh various objects, using the pound, half pound, and quarter pound. The ounce may be introduced here, although it is taken up when this topic is next discussed, on page 56.

CHAPTER II

I. REVIEW OF NUMBERS TO 100

COUNTING

10	20	30	40	50
60	70	80	90	100

ORAL EXERCISE

1. How many books are there in the picture?
If there were 10 more, how many would there be?



2. How many blocks in the black and white pile? How many 10's in this pile?
3. There are 3 columns of smaller blocks. How many blocks in each column? How many in all?
4. There are 4 bundles of splints in the picture, 10 in each bundle. How many splints in all?
5. There are 5 packages of envelopes, 10 in each package. How many envelopes are there?

ORAL EXERCISE

1. If you call 2 tens *twenty*, and write it 20, and 3 tens *thirty*, and write it 30, what should you call 4 tens, and how should you write it? The same for 5 tens, and so on to 10 tens.

2. State rapidly the sums:

2	2 tens	20	30	40	30	40
<u>3</u>	<u>3 tens</u>	<u>30</u>	<u>40</u>	<u>50</u>	<u>60</u>	<u>20</u>

3. How much is $\frac{1}{2}$ of 10? $\frac{1}{2}$ of 10 tens? $\frac{1}{2}$ of 100? How many cents in $\frac{1}{2}$ of 100 cents?

One half of a dollar is 50 cents.

4. Subtract rapidly:

5	5 tens	50	70	90	90	60
<u>2</u>	<u>2 tens</u>	<u>20</u>	<u>30</u>	<u>40</u>	<u>30</u>	<u>40</u>

5. Multiply rapidly:

2	2 tens	20	10	10	10	10
<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>7</u>

In the above work teachers may find it of advantage to place columns of 10's, 20's, and 30's on the board, similar to the columns of 2's and 3's on page 15.

WRITTEN EXERCISE

1. Write in figures: thirty, seventy, fifty, ninety, sixty, eighty, one hundred.

2. Write in words: 10, 60, 100, 90, 80, 20, 40.

ORAL EXERCISE

1. Point to 10 splints and 3 splints in the picture. How much is $10 + 3$? Write the number on the blackboard.



2. In the second group, how many packages of 10 splints each, and how many splints over? Write the number. Do this for the other groups.

Let the children make bundles of splints, but do this only until the idea is clear. After that the objects become harmful.

3. Read the numbers :

15	21	32	48	56	60
35	65	78	83	90	99

4. How many days in this month? This is what day of the month?

5. Count the children in your class; the desks in your room; the panes of glass in the windows.

These are merely suggestive of other counting exercises. In schools where a record of temperature is kept, pupils may read the thermometer daily and write the record on the board.

In the number 25 we speak of the 5 as *units*, the 2 as *tens*.

WRITTEN EXERCISE

Write twenty-seven, seventy-nine, sixty-eight, forty-two, eighty, ninety-four.

ADDITION

ORAL EXERCISE

Review rapidly the following:

1.	1	2	3	4	5	6	7	8	9
	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
2.	1	2	3	4	5	6	7	8	9
	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>
3.	1	2	3	4	5	6	7	8	9
	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>
4.	1	2	3	4	5	6	7	8	9
	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>
5.	1	2	3	4	5	6	7	8	9
	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>
6.	1	2	3	4	5	6	7	8	9
	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>
7.	1	2	3	4	5	6	7	8	9
	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>
8.	1	2	3	4	5	6	7	8	9
	<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u>
9.	1	2	3	4	5	6	7	8	9
	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>

This table should be reviewed frequently.

ORAL EXERCISE

Find the sums in Exs. 1-2:

$$\begin{array}{r} 1. \quad 4 \quad 14 \quad 34 \quad 5 \quad 25 \quad 56 \quad 7 \quad 17 \\ \quad \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{3} \quad \underline{3} \quad \underline{1} \quad \underline{2} \quad \underline{2} \end{array}$$

$$\begin{array}{r} 2. \quad 47 \quad 97 \quad 3 \quad 63 \quad 83 \quad 3 \quad 53 \quad 83 \\ \quad \underline{2} \quad \underline{2} \quad \underline{4} \quad \underline{4} \quad \underline{4} \quad \underline{6} \quad \underline{6} \quad \underline{6} \end{array}$$

Find the sums in Exs. 3-8, stating first the units, then the tens, then the answer:

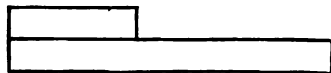
$$\begin{array}{r} 3. \quad 1 \quad 4. \quad 10 \quad 5. \quad 10 \quad 6. \quad 10 \quad 7. \quad 12 \quad 8. \quad 16 \\ \quad \underline{2} \quad \quad \underline{20} \quad \quad \underline{3} \quad \quad \underline{23} \quad \quad \underline{20} \quad \quad \underline{30} \\ \quad \underline{3} \quad \quad \underline{30} \quad \quad \underline{5} \quad \quad \underline{35} \quad \quad \underline{34} \quad \quad \underline{40} \end{array}$$

9. How much is $5 + 5$? $5 + 5 + 5 + 5$?

10. How much is $25 + 25 + 25 + 25$? Then how much is $\frac{1}{4}$ of 100?

A quarter of a dollar is 25 cents.

11. If the square is called 1, one oblong is 10 and the other 4.



What are the two together?



12. These oblongs show what numbers?

Teachers will find it helpful to use paper rectangles like these to explain addition and subtraction.

ORAL EXERCISE

BEAN-BAG SCORE

Elsie, Clyde, and Frank played throwing bean bags into the rings to-day. A bag in the outer ring counts 1; one in the inner ring counts 3.

1. Elsie threw 2 bags in the inner ring and also 1 in the outer ring. What was her score?

2. Then she threw 1 in the inner ring and 2 in the outer one. What was her score then?



3. The third time she threw, 1 went in the inner ring, 1 in the outer ring, and 1 did not go in either. What was her score then? Write her scores on the blackboard and add.

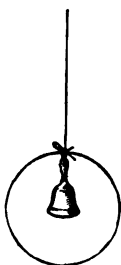
4. Clyde's first throw was 3 in the inner ring. The second was 2 in the inner ring and 1 outside of both rings. The third was 1 in the inner ring and the other 2 outside of both rings. How much did he make in all?

5. Frank's score was 3 and 0. He then threw 3 in the inner ring. What was his total score? Who beat in the game?

ORAL EXERCISE

OTHER NUMBER GAMES

1. Laura and Marion threw bean bags through a hanging hoop in which was a bell. Every bag that went through without ringing the bell counted 10. If the bell rang, the throw counted only 2. In ten throws each, the score was:

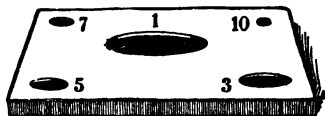


Laura, 0, 0, 2, 10, 0, 0, 2, 2, 0, 10;

Marion, 10, 0, 0, 0, 0, 2, 0, 0, 10, 2.

What was the score of each? Which won the game?

2. Ned and Jack cut holes in the bottom of a cardboard box, like this. They numbered the largest 1, the next 3, the next 5, the next 7, and the smallest 10. They put the box on the floor and dropped marbles from the height of a table. With 10 marbles each, the score was:



Ned, 1, 1, 3, 1, 0, 10, 7, 5, 0, 1;

Jack, 0, 5, 0, 1, 1, 1, 1, 7, 7, 10.

What was the score of each?

These and ringtoss are merely suggestive of number games that children may be encouraged to play, the work being entirely oral. Many simple games of this kind can be bought at toy stores.

WRITTEN EXERCISE

Add the following:

- | | | | | | |
|---|---|--|---|--|--|
| 1. $\begin{array}{r} 23 \\ 32 \\ \hline \end{array}$ | 2. $\begin{array}{r} 42 \\ 50 \\ \hline \end{array}$ | 3. $\begin{array}{r} 29 \\ 60 \\ \hline \end{array}$ | 4. $\begin{array}{r} 35 \\ 44 \\ \hline \end{array}$ | 5. $\begin{array}{r} 61 \\ 27 \\ \hline \end{array}$ | 6. $\begin{array}{r} 33 \\ 44 \\ \hline \end{array}$ |
| 7. $\begin{array}{r} 23 \\ 42 \\ 3 \\ \hline \end{array}$ | 8. $\begin{array}{r} 34 \\ 25 \\ 30 \\ \hline \end{array}$ | 9. $\begin{array}{r} 24 \\ 40 \\ 35 \\ \hline \end{array}$ | 10. $\begin{array}{r} 22 \\ 33 \\ 43 \\ \hline \end{array}$ | 11. $\begin{array}{r} 12 \\ 41 \\ 15 \\ \hline \end{array}$ | 12. $\begin{array}{r} 16 \\ 10 \\ 32 \\ \hline \end{array}$ |
| 13. $\begin{array}{r} 22 \\ 31 \\ 14 \\ 11 \\ \hline \end{array}$ | 14. $\begin{array}{r} 23 \\ 40 \\ 6 \\ 10 \\ \hline \end{array}$ | 15. $\begin{array}{r} 13 \\ 21 \\ 44 \\ 10 \\ \hline \end{array}$ | 16. $\begin{array}{r} 26 \\ 42 \\ 11 \\ 10 \\ \hline \end{array}$ | 17. $\begin{array}{r} 25 \\ 30 \\ 20 \\ 2 \\ \hline \end{array}$ | 18. $\begin{array}{r} 12 \\ 13 \\ 41 \\ 10 \\ \hline \end{array}$ |
| 19. $\begin{array}{r} 12 \\ 20 \\ 3 \\ 2 \\ 41 \\ \hline \end{array}$ | 20. $\begin{array}{r} 26 \\ 31 \\ 11 \\ 10 \\ 20 \\ \hline \end{array}$ | 21. $\begin{array}{r} 33 \\ 32 \\ 3 \\ 10 \\ 10 \\ \hline \end{array}$ | 22. $\begin{array}{r} 41 \\ 4 \\ 2 \\ 20 \\ 11 \\ \hline \end{array}$ | 23. $\begin{array}{r} 33 \\ 23 \\ 30 \\ 2 \\ 10 \\ \hline \end{array}$ | 24. $\begin{array}{r} 11 \\ 22 \\ 33 \\ 2 \\ 20 \\ \hline \end{array}$ |
25. $4 + 3 + 11 + 0 + 21$. 26. $20 + 10 + 1 + 2 + 3$.
 27. $30 + 3 + 40 + 4 + 1$. 28. $10 + 22 + 4 + 1 + 2$.
 29. $20 + 2 + 20 + 2 + 2$. 30. $30 + 11 + 2 + 1 + 3$.
 31. $60 + 10 + 4 + 1 + 2$. 32. $40 + 20 + 3 + 5 + 1$.
 33. $30 + 20 + 5 + 2 + 1$. 34. $2 + 2 + 3 + 4 + 5 + 7$.
 35. $3 + 2 + 5 + 1 + 0 + 8$. 36. $4 + 1 + 0 + 6 + 2 + 3$.
 37. $2 + 6 + 3 + 5 + 1 + 2$. 38. $3 + 2 + 4 + 1 + 7 + 5$.
 39. $6 + 2 + 1 + 2 + 3 + 4$. 40. $2 + 4 + 3 + 1 + 3 + 2$.
 41. $5 + 5 + 2 + 2 + 1 + 1$. 42. $2 + 2 + 4 + 4 + 1 + 2$.
 43. $6 + 4 + 7 + 3 + 8 + 2$. 44. $14 + 10 + 21 + 20 + 11$.

WRITTEN EXERCISE

1. There are 15 apples in one pile and 21 in another; how many in both piles?

2. Mary has 17 ct., and she earns 21 ct., and her father gives her 10 ct. How much has she?

3. Kate has 28 chickens, and Mollie has 20; how many have they together?

Make problems for Exs. 4-17, and find the answers:

4. 2 ct. + 3 ct. + 5 ct.
5. 3 qt. + 2 qt. + 1 qt.
6. 2 ft. + 4 ft. + 15 ft.
7. 3 lb. + 6 lb. + 40 lb.
8. \$2 + \$5 + \$7 + \$1.
9. 4 lb. + 2 lb. + 71 lb.
10. 4 + 2 + 3 + 5 + 2 + 1.
11. 6 + 4 + 2 + 3 + 5 + 1.
12. \$14 + \$2 + \$20 + \$2.
13. \$14 + \$30 + \$1 + \$20.
14. \$21 + \$30 + \$15 + \$2.
15. 21 boys + 3 boys + 14 boys.
16. 12 girls + 3 girls + 22 girls.
17. 4 marbles + 11 marbles + 32 marbles.

Add the following:

18. 20	19. 12	20. 21	21. 12	22. 51	23. 13
11	2	21	3	3	12
13	30	21	20	2	11
22	3	21	2	2	10
10	40	12	10	20	1
<u>11</u>	<u>2</u>	<u>12</u>	<u>30</u>	<u>20</u>	<u>2</u>

SUBTRACTION

ORAL EXERCISE

Subtract, stating first the units, then the tens :

1. 9 <u>3</u>	2. 90 <u>30</u>	3. 99 <u>33</u>	4. 96 <u>32</u>	5. 87 <u>43</u>	6. 76 <u>32</u>
7. 7 <u>4</u>	8. 70 <u>40</u>	9. 77 <u>44</u>	10. 78 <u>42</u>	11. 87 <u>34</u>	12. 75 <u>22</u>

WRITTEN EXERCISE

Copy the following and subtract :

1. 98 <u>73</u>	2. 89 <u>46</u>	3. 93 <u>31</u>	4. 64 <u>24</u>	5. 55 <u>21</u>	6. 63 <u>52</u>
7. 82 <u>50</u>	8. 78 <u>37</u>	9. 65 <u>52</u>	10. 53 <u>12</u>	11. 31 <u>11</u>	12. 29 <u>18</u>

ORAL EXERCISE

SOME OF YOUR PURCHASES

1. If you pay 35 ct. for a book, and 5 ct. for a pencil, how much do both cost ?

2. If you give the merchant half a dollar for them, how much change should you receive ?

3. How much must you add to this change to have enough to buy a 15-ct. drawing book ?

4. If you pay 12 ct. for candy, and 5 ct. for an orange, how much do you pay for both ?

ORAL EXERCISE

1. How much will a 10-ct. ball and 15 ct. worth of marbles cost?

2. John is 7 years old, and is 4 years older than his sister. How old is his sister?

3. If Mary has a 10-ct. piece, a 5-ct. piece, and three 1-ct. pieces, how much money has she?

4. Helen had 42 ct. in her bank, and her aunt gave her 10 ct. more. How much money had she then?

5. In our class there are 29 children. In the class below there are 5 less. How many are in that class?

6. There are 15 men in a band. One plays the bass drum, 1 plays the small drum, and the rest play horns or fifes. How many play horns or fifes?

Teachers usually find it interesting to children to let them occasionally make their own oral problems.

WRITTEN EXERCISE

1. If one class has 28 children and another has 12 less, how many are in the other class?

2. If there are 22 in one class and 15 more in another class, how many are in the other class?

3. If there are 41 children in one class and 34 in another class, how many are in both classes?

4. If you should pay 40 ct. for a book, 15 ct. for a tablet, and 2 ct. for a pencil, how much would you pay for all?

WRITTEN EXERCISE

Subtract:

1. $\begin{array}{r} 39 \\ 17 \\ \hline \end{array}$	2. $\begin{array}{r} 28 \\ 16 \\ \hline \end{array}$	3. $\begin{array}{r} 92 \\ 71 \\ \hline \end{array}$	4. $\begin{array}{r} 48 \\ 32 \\ \hline \end{array}$	5. $\begin{array}{r} 61 \\ 20 \\ \hline \end{array}$	6. $\begin{array}{r} 86 \\ 5 \\ \hline \end{array}$
--	--	--	--	--	---

7. $\begin{array}{r} 47 \\ 16 \\ \hline \end{array}$	8. $\begin{array}{r} 37 \\ 21 \\ \hline \end{array}$	9. $\begin{array}{r} 48 \\ 37 \\ \hline \end{array}$	10. $\begin{array}{r} 69 \\ 34 \\ \hline \end{array}$	11. $\begin{array}{r} 81 \\ 20 \\ \hline \end{array}$	12. $\begin{array}{r} 77 \\ 6 \\ \hline \end{array}$
--	--	--	---	---	--

13. $\begin{array}{r} 59 \\ 16 \\ \hline \end{array}$	14. $\begin{array}{r} 78 \\ 17 \\ \hline \end{array}$	15. $\begin{array}{r} 37 \\ 21 \\ \hline \end{array}$	16. $\begin{array}{r} 29 \\ 19 \\ \hline \end{array}$	17. $\begin{array}{r} 82 \\ 22 \\ \hline \end{array}$	18. $\begin{array}{r} 37 \\ 27 \\ \hline \end{array}$
---	---	---	---	---	---

19. $\begin{array}{r} 40 \\ 30 \\ \hline \end{array}$	20. $\begin{array}{r} 62 \\ 50 \\ \hline \end{array}$	21. $\begin{array}{r} 48 \\ 38 \\ \hline \end{array}$	22. $\begin{array}{r} 72 \\ 60 \\ \hline \end{array}$	23. $\begin{array}{r} 89 \\ 9 \\ \hline \end{array}$	24. $\begin{array}{r} 43 \\ 10 \\ \hline \end{array}$
---	---	---	---	--	---

25. $\begin{array}{r} 79 \\ 49 \\ \hline \end{array}$	26. $\begin{array}{r} 28 \\ 17 \\ \hline \end{array}$	27. $\begin{array}{r} 49 \\ 29 \\ \hline \end{array}$	28. $\begin{array}{r} 53 \\ 33 \\ \hline \end{array}$	29. $\begin{array}{r} 63 \\ 23 \\ \hline \end{array}$	30. $\begin{array}{r} 44 \\ 32 \\ \hline \end{array}$
---	---	---	---	---	---

31. $37 - 16$	32. $42 - 12$	33. $67 - 42$	34. $29 - 12$
---------------	---------------	---------------	---------------

35. $88 - 42$	36. $79 - 63$	37. $88 - 22$	38. $99 - 29$
---------------	---------------	---------------	---------------

39. $97 - 26$	40. $87 - 73$	41. $61 - 41$	42. $72 - 62$
---------------	---------------	---------------	---------------

43. $49 - 19$	44. $69 - 58$	45. $98 - 65$	46. $92 - 50$
---------------	---------------	---------------	---------------

47. $77 - 44$	48. $95 - 14$	49. $83 - 31$	50. $59 - 37$
---------------	---------------	---------------	---------------

51. $87 - 72$	52. $85 - 23$	53. $87 - 21$	54. $78 - 30$
---------------	---------------	---------------	---------------

55. $91 - 20$	56. $71 - 40$	57. $61 - 10$	58. $82 - 20$
---------------	---------------	---------------	---------------

59. $53 - 23$	60. $67 - 66$	61. $74 - 34$	62. $92 - 91$
---------------	---------------	---------------	---------------

63. $85 - 24$	64. $69 - 35$	65. $47 - 27$	66. $53 - 13$
---------------	---------------	---------------	---------------

67. How much is 77 minus 53? 48 minus 30?

68. What number added to 23 makes 89?

69. What number subtracted from 56 leaves 23?

70. What is the difference between 98 and 27?

WRITTEN EXERCISE

1. Eloise has 75 ct. and spends 34 ct. How much has she left?

2. Ralph had 18 papers to sell; he has sold 12. How many has he left?

3. There were 48 apples in a basket; 27 have been taken out. How many are left?

Make problems for Exs. 4-18, and find the answers:

- | | | |
|-------------------|-------------------|------------|
| 4. 57-26. | 5. 29-13. | 6. 75-15. |
| 7. 95-25. | 8. 68-24. | 9. 73-20. |
| 10. 25 ft.-4 ft. | 11. 75 ct.-5 ct. | 12. 72-10. |
| 13. 75 ct.-25 ct. | 14. 78 ft.-16 ft. | 15. 82-30. |
| 16. 15 yd.-12 yd. | 17. 90 yd.-20 yd. | 18. 62-20. |

Find the missing numbers in Exs. 19-54:

- | | | |
|---------------------|---------------------|---------------------|
| 19. $15 + * = 18$. | 20. $23 + * = 29$. | 21. $35 + * = 49$. |
| 22. $22 + * = 59$. | 23. $37 + * = 97$. | 24. $41 + * = 83$. |
| 25. $27 + * = 87$. | 26. $13 + * = 86$. | 27. $40 + * = 98$. |
| 28. $* + 14 = 75$. | 29. $* + 23 = 49$. | 30. $* + 81 = 92$. |
| 31. $62 - * = 60$. | 32. $75 - * = 72$. | 33. $87 - * = 83$. |
| 34. $28 - * = 15$. | 35. $67 - * = 37$. | 36. $71 - * = 31$. |
| 37. $73 - * = 20$. | 38. $98 - * = 75$. | 39. $99 - * = 66$. |
| 40. $* - 15 = 60$. | 41. $* - 20 = 33$. | 42. $* - 45 = 10$. |
| 43. $* - 11 = 27$. | 44. $* - 12 = 35$. | 45. $* - 22 = 17$. |
| 46. $5 + * = 85$. | 47. $23 + * = 99$. | 48. $18 + * = 89$. |
| 49. $* + 57 = 78$. | 50. $71 - * = 70$. | 51. $62 - * = 41$. |
| 52. $93 - * = 31$. | 53. $* - 70 = 11$. | 54. $* - 30 = 21$. |

MULTIPLICATION

ORAL EXERCISE

1. Add 2 ct. and 2 ct. Then how many are 2 times 2 ct.?

2. How many are 2 times \$3? 2 times 4 inches? 2 times 5 pounds? 2 times \$6?

3. How many are three 2's? three 3's? three 4's? Draw pictures to explain your answers.

4. How many are four 2's? || || || ||
How many are four 3's? How ||| ||| ||| |||
many are five 2's? How many || || || || ||
are six 2's? || || || || || ||

5. How many are two 4's? three 4's? two 5's? two 6's?

Learn these:

2 twos = 4	2 threes = 6	2 fours = 8
3 twos = 6	3 threes = 9	3 fours = 12
4 twos = 8	4 threes = 12	2 fives = 10
5 twos = 10		
6 twos = 12		2 sixes = 12

6. How many are 3 times 3? 3 times 3 tens? 3 times 30? 4 times 20?

7. How many are 5 times 2 tens? 5 times 20? 2 times 30? 3 times 30?

8. Multiply:

\$3	3 tens	30	30 + 1	31	32
<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

DIVISION

ORAL EXERCISE

1. How many twos do you see in 4? || ||
 2. How many twos do you see in 6? || || ||
 How many threes? ||| |||
 3. How many twos do you see in 8? || || || ||
 How many fours? |||| ||||
 4. How many fours are there in 12?
 How many sixes? Show this on the blackboard.

Learn these:

$4 \div 2 = 2$	$12 \div 2 = 6$	$8 \div 4 = 2$
$6 \div 2 = 3$	$6 \div 3 = 2$	$12 \div 4 = 3$
$8 \div 2 = 4$	$9 \div 3 = 3$	$10 \div 5 = 2$
$10 \div 2 = 5$	$12 \div 3 = 4$	$12 \div 6 = 2$

We shall later write $6 \div 3 = 2$ like this: $\begin{array}{r} 3 \overline{)6} \\ 2 \end{array}$
 Your teacher may have you write it so now.

5. How much is $4 \div 2$? $40 \div 2$? $60 \div 2$?
 6. How much is $6 \div 3$? $60 \div 3$? $90 \div 3$?
 7. How much is $\frac{1}{2}$ of 40? of 60? of 80? of 100?
 8. How much is $\frac{1}{3}$ of 60? $\frac{1}{3}$ of 90? $\frac{1}{4}$ of 80?
 9. If line a represents 20, what does b represent? If b represents 20, what $\begin{array}{l} a \text{ —————} \\ b \text{ —————} \\ c \text{ —————} \\ d \text{ —————} \end{array}$
 does a represent?
 10. If b represents 20, what $\begin{array}{l} a \text{ —————} \\ b \text{ —————} \\ c \text{ —————} \\ d \text{ —————} \end{array}$
 does c represent? If c represents 20, what does b represent? d ? a ?

ORAL EXERCISE

SOME PURCHASES FOR THE HOME

1. When peaches are selling for 10 ct. a quart, how much will 2 qt. cost?

2. When milk costs 6 ct. a quart, how much will 1 pt. cost? 3 pt.? 2 qt.?

3. When cream costs 40 ct. a quart, how much will 1 pt. cost? (Think of $\frac{1}{2}$ of 4, then $\frac{1}{2}$ of 40.) How much will $\frac{1}{2}$ pt. cost?

4. When sugar is selling at 8 ct. a pound, how much will $\frac{1}{4}$ pound cost? $\frac{1}{2}$ pound?

5. Suppose Kate wishes to serve some peaches and cream to her friends, and uses 1 qt. of peaches, $\frac{1}{2}$ pt. of cream, and $\frac{1}{4}$ pound of sugar; at the prices given, how much will the peaches, cream, and sugar cost? (Write on the blackboard and add.)

WRITTEN EXERCISE

1. Copy the following and write the results:

$\frac{1}{2}$ of 6	$\frac{1}{2}$ of 60	$\frac{1}{3}$ of 6	$\frac{1}{3}$ of 60
$\frac{1}{6}$ of 6	$\frac{1}{6}$ of 60	$\frac{1}{2}$ of 8	$\frac{1}{2}$ of 80
$\frac{1}{4}$ of 8	$\frac{1}{4}$ of 80	$\frac{1}{8}$ of 8	$\frac{1}{8}$ of 80

2. Add: 20 ct.	30 lb.	60 qt.	\$22
30	20	10	13
40	10	5	31
2	5	1	10
<u>3</u>	<u>4</u>	<u>2</u>	<u>2</u>

NUMBER TABLE

0	10	20	30	40	50	60	70	80	90
1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99

The table should be written upon the blackboard.

ORAL EXERCISE

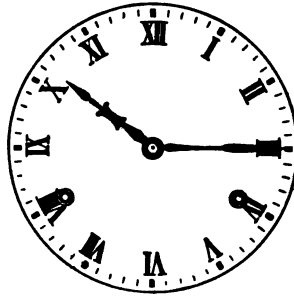
1. Point to the line of numbers less than 10. If you add 10 to each, which line have you?
2. Point to the line of 10's. If you add 1 to each number, which line have you? If you add 1 more?
3. Of the numbers below 100, how many end in 9? Point to them. How many end in 8?
4. How many columns are there? How many numbers in a column? Then how many numbers in all, including 0?
5. Count by 10's, beginning with 0; beginning with 1; beginning with 2; with 3.

The above table offers many opportunities for oral work, as in counting by 9's and 11's, adding, and performing other operations.

TIME

ORAL EXERCISE

1. Read the figures, or numerals, on the clock.
2. Which hand tells the hours? the minutes?
3. How long does it take the hour hand to pass from I to II? How long does it take the minute hand?
4. How long does it take the hour hand to pass around from XII to XII again? the minute hand?



5. What time is it by the clock in the picture? by the school clock?
6. How many minutes in an hour? in $\frac{1}{2}$ hour? How many hours in a day, including the night?

The figures on clocks are such as the Romans used long ago. Our numerals were brought from India by the Arabs. The Roman and Arabic numerals to twelve are:

I, II, III, IIII or IV, V, VI, VII, VIII, IX, X, XI, XII.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

You have learned that

60 minutes = 1 hour.

24 hours = 1 day.

We usually write min. for minute or minutes, hr. for hour or hours, da. for day or days, A.M. for forenoon, P.M. for afternoon.

We write 15 minutes after 2 like this, 2:15.

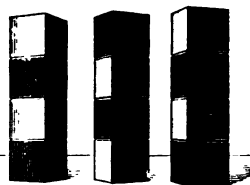
THE DOZEN

ORAL EXERCISE

1. How many cubes make a dozen?
2. What other name can you give to a dozen inches?

3. Name some things that are sold by the dozen. At what price?

4. How many cubes make a half dozen? a quarter of a dozen? a third of a dozen? Point to them.



5. How many fours do you see in a dozen? How many threes? How many twos? How many sixes? Point to them.

6. A hen sits on a dozen eggs and hatches all but two. How many chickens are hatched?

7. When eggs are worth 20 ct. a dozen, how much does a half dozen cost?

8. A newsboy buys a dozen papers for 8 ct., and sells them at a cent apiece. How much does he make?



9. John had a dozen firecrackers. When they were lighted, all but $\frac{1}{4}$ of them exploded. How many firecrackers exploded?

We usually write doz. for dozen.

II. NUMBERS TO 1000

READING AND WRITING NUMBERS

ORAL EXERCISE

1. Here are 4 bundles of splints, 10 in a bundle. How many splints are there? Write the number on the blackboard.



2. Here are 3 bundles of splints, 100 in a bundle. How many splints are there? Write the number on the blackboard. If there were 400 more, how many would there be? Write the number.



3. Here is a larger bundle of splints, as many as in 10 bundles of 100 each. How many splints are there in this bundle? Write the number on the blackboard.



WRITTEN EXERCISE

1. Write in figures the numbers one hundred, six hundred, nine hundred, one thousand.

2. Write in words the names of these numbers:

300 700 50 1000 600 75

ORAL EXERCISE

1. Count by 100's from 100 to 1000.

2. Add rapidly:

2	20	22	200	6	60	66	600
<u>3</u>	<u>30</u>	<u>33</u>	<u>300</u>	<u>3</u>	<u>30</u>	<u>33</u>	<u>300</u>

In such cases the numbers should be written on the blackboard.

3. Subtract rapidly:

7	70	77	700	9	90	99	900
<u>4</u>	<u>40</u>	<u>44</u>	<u>400</u>	<u>2</u>	<u>20</u>	<u>22</u>	<u>200</u>

4. Multiply rapidly:

1	10	3	30	33	300	40	400
<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

5. Tell rapidly the values of $\frac{1}{2}$ of 4, $\frac{1}{2}$ of 40, $\frac{1}{2}$ of 400, $\frac{1}{3}$ of 3, $\frac{1}{3}$ of 30, $\frac{1}{3}$ of 300.

6. If John had 200 yards of kite string and lost $\frac{1}{2}$ of it, how much would he have left?

7. If there are 100 firecrackers in a bunch, how many are there in 3 bunches? in 10 bunches?

8. If you take 600 steps in walking from one street corner to the next, how many steps will you take in walking half this distance?

WRITTEN EXERCISE

Write the numbers from 1 to 9; below them, the 10's from 10 to 90; below these, the 100's from 100 to 900.

**ORAL EXERCISE**

1. How many splints are there in the picture?
2. Read the numbers:

342 352 362 372 392 312 302

3. Read the numbers:

100 101 102 105 110 111 123
 200 202 203 205 220 222 234
 900 909 910 905 990 999 987

4. Open this book to page 147; to page 203.
5. The numbers below 10 are called *units*. Do you write the units in the left-hand or in the right-hand place? Where do you write the *tens*? Where do you write the *hundreds*?
6. Name the figures in units' place in 475; in tens' place; in hundreds' place.

WRITTEN EXERCISE

1. Write in figures:

Five hundred fifty-five	Six hundred nine
Two hundred forty-nine	Three hundred three
One hundred twenty-one	Eight hundred eighty

2. Write in words: 242, 307, 520, 634, 987.

ORAL EXERCISE

1. Add rapidly:

1	10	100	110	111	123
2	20	200	220	222	231
3	<u>30</u>	<u>300</u>	<u>330</u>	<u>333</u>	<u>312</u>

2. Subtract rapidly:

7	70	700	770	777	777
5	<u>50</u>	<u>500</u>	<u>550</u>	<u>555</u>	<u>543</u>

George, Will, and Kate played they had a horse show.

3. Ten grown people came. How much did they all pay at 3 pins each?

4. Twenty children came. How much did they all pay at 2 pins each?

5. How many pins in all were taken by the doorkeeper?

6. The doorkeeper was paid 10 pins. How many pins were left?

WRITTEN EXERCISE

1. Write in columns, and add first the units, then the tens, then the hundreds:

$312 + 234 + 412$	$423 + 102 + 361$
$220 + 202 + 222$	$371 + 316 + 101$

2. Write in columns and subtract:

$964 - 512$	$873 - 401$
$796 - 514$	$985 - 472$

MEASURES

ORAL EXERCISE

1. How many inches in 1 ft.?
2. What part of 1 ft. is 1 in.? 3 in.? 4 in.? 6 in.?
3. How many feet in 1 yd.? 1 ft. is what part of 1 yd.?
4. How many inches in $\frac{1}{2}$ ft.? in $1\frac{1}{2}$ ft.? in $\frac{1}{4}$ ft.? in $1\frac{1}{4}$ ft.?
5. How many inches in $\frac{1}{3}$ ft.? in $1\frac{1}{3}$ ft.? in 2 ft.? in $2\frac{1}{3}$ ft.?
6. Measure the length of the blackboard in feet and inches.
7. How many inches are there in 1 ft. 1 in.? 1 ft. 2 in.? 1 ft. 4 in.? 1 ft. 6 in.? 1 ft. 8 in.? 1 ft. 10 in.?
8. Write on the blackboard what you think is the width of the window in feet and inches. Measure and see if you are right.

WRITTEN EXERCISE

1. Add :

12 ft.	123 ft.	3 in.	12 ft.	123 ft.
<u>20</u>	<u>210</u>	<u>6</u>	<u>21</u>	<u>214</u>

2. Subtract :

39 ft.	439 ft.	10 in.	39 ft.	439 ft.
<u>10</u>	<u>210</u>	<u>7</u>	<u>14</u>	<u>214</u>

ORAL EXERCISE

1. If you put a 1-pound weight on one side of the scales, do you know how many ounce weights must be put on the other side to balance it?

2. Then how many ounces make a pound? Then 1 ounce is what part of a pound?

If there are scales in the school, children should weigh various objects, and also find that 16 ounces = 1 pound. Children sometimes make bags of different sizes, putting in enough sand to make them weigh 1 pound, $\frac{1}{2}$ pound, $\frac{1}{4}$ pound. The weights are then told, the children's eyes being closed.

You have found that

16 ounces = 1 pound.

We usually write oz. for ounce or ounces, lb. for pound or pounds.

3. The average height and weight of children of your age is about as follows:

	<i>Boys</i>	<i>Girls</i>	<i>Boys</i>	<i>Girls</i>
7 yr.	44 in.	44 in.	48 lb.	47 lb.
8	46	46	52	50
9	50	49	57	55

Compare your height and weight with the average.

WRITTEN EXERCISE

1. Add: 4 lb. + 5 lb.; 40 lb. + 50 lb.; 400 lb. + 500 lb.; 423 lb. + 512 lb.

2. Subtract: 9 lb. - 4 lb.; 90 lb. - 40 lb.; 900 lb. - 400 lb.; 935 lb. - 423 lb.

ORAL EXERCISE

1. How many small squares in this large square?
Half are white. How many are white?

2. Look at the picture and see $\frac{1}{2}$ of
16; $\frac{1}{4}$ of 16.



3. Then how many ounces in $\frac{1}{2}$ lb.?
in $\frac{1}{4}$ lb.?

4. How many pounds is $\frac{1}{2}$ of 12 lb.? $\frac{1}{4}$ of
12 lb.?

5. When sugar is 6 ct. a pound, how much does
 $\frac{1}{2}$ lb. cost?

6. At 2 ct. a pound, how much must you pay for
4 lb. of salt? for $\frac{1}{2}$ lb.?

7. At 7 ct. a pound, how much must you pay
for 10 lb. of oatmeal?

8. At 16 ct. a pound, how much must you pay
for $\frac{1}{2}$ lb. of grapes? for $\frac{1}{4}$ lb.?

WRITTEN EXERCISE

1. If you weigh	44 lb. 7 oz.
And your books weigh	2 3
The total weight is	<hr/> * lb. * oz.

2. If Charles weighs	51 lb. 8 oz.
And his dog weighs	22
And his books	2 4
And his sled	10
The total weight is	<hr/> * lb. * oz.

WRITTEN EXERCISE

Add:

1. 231 322 <u>123</u>	2. 127 621 <u>140</u>	3. 225 502 <u>72</u>	4. 323 270 <u>102</u>	5. 629 30 <u>210</u>
6. 120 23 4 <u>640</u>	7. 252 104 420 12 <u>12</u>	8. 121 32 5 400 <u>400</u>	9. 102 571 203 12 <u>12</u>	10. 400 275 102 20 <u>20</u>
11. 201 122 141 20 <u>3</u>	12. 123 61 400 13 <u>201</u>	13. 301 62 13 500 <u>12</u>	14. 101 252 21 102 <u>202</u>	15. 521 102 20 3 <u>2</u>

16. \$121 + \$242 + \$103.
17. 33 in. + 21 in. + 324 in.
18. 107 ft. + 621 ft. + 30 ft.
19. 62 ft. + 103 ft. + 934 ft.
20. \$300 + \$62 + \$20 + \$4.
21. 125 lb. + 22 lb. + 230 lb.
22. 204 lb. + 62 lb. + 122 lb.
23. 21 yd. + 200 yd. + 75 yd.
24. \$20 + \$200 + \$2 + \$222.
25. \$6 + \$60 + \$600 + \$222.
26. 14 yd. + 202 yd. + 401 yd.
27. \$15 + \$150 + \$501 + \$111.
28. \$12 + \$120 + \$101 + \$333.

WRITTEN EXERCISE

- | | | |
|------------------|------------------|------------------|
| 1. $397 - 92$. | 2. $486 - 75$. | 3. $298 - 75$. |
| 4. $546 - 32$. | 5. $698 - 63$. | 6. $427 - 13$. |
| 7. $987 - 632$. | 8. $798 - 345$. | 9. $829 - 602$. |

Find the missing numbers in Exs. 10-17:

- | | |
|-----------------------|-----------------------|
| 10. $683 - * = 32$. | 11. $891 - * = 20$. |
| 12. $987 - * = 65$. | 13. $832 - * = 10$. |
| 14. $775 - * = 700$. | 15. $698 - * = 125$. |
| 16. $379 - * = 240$. | 17. $456 - * = 125$. |

18. If a man earns \$125 in January, \$202 in February, and \$150 in March, how much does he earn in the three months?

19. If he spends \$225 during the three months, how much will he have left?

Make problems for Exs. 20-31, and find the answers:

- | | |
|--|--|
| 20. $\$125 + \230 . | 21. $\$270 + \106 . |
| 22. $\$175 + \300 . | 23. $\$450 + \306 . |
| 24. $\$650 - \150 . | 25. $\$775 - \125 . |
| 26. $\$960 - \140 . | 27. $\$395 - \162 . |
| 28. $121 \text{ ft.} + 67 \text{ ft.}$ | 29. $421 \text{ ft.} + 75 \text{ ft.}$ |
| 30. $62 \text{ yd.} + 104 \text{ yd.}$ | 31. $32 \text{ in.} + 107 \text{ in.}$ |

Find the missing numbers in Exs. 32-37:

- | | |
|-----------------------|-----------------------|
| 32. $600 + * = 705$. | 33. $325 + * = 427$. |
| 34. $322 + * = 344$. | 35. $275 + * = 286$. |
| 36. $127 + * = 237$. | 37. $225 + * = 335$. |

ORAL EXERCISE

1. Point to the pint, quart, and gallon measures.



2. Also point to the quart, peck, and bushel measures.

3. Which are used for liquids like milk and oil?

4. Which are used for anything dry like grain and nuts?

5. Can you tell how many quarts make a gallon?
A quart is what part of a gallon?

6. Do you know how many quarts make a peck?
How many pecks make a bushel?

7. A pint is what part of a quart? of a gallon?
A quart is what part of a peck? A peck is what part of a bushel?

You have learned that

IN MEASURING LIQUIDS

2 pints (pt.) = 1 quart (qt.).

4 quarts = 1 gallon (gal.).

IN DRY MEASURE

8 quarts = 1 peck (pk.).

4 pecks = 1 bushel (bu.).

ORAL EXERCISE

BUYING LIQUIDS

1. At 6 ct. a quart, how much does 1 pt. of milk cost?
2. At 6 ct. a quart, how much must you pay for 2 qt.?
3. Oil for the lamp costs 14 ct. a gallon. How much will 2 qt. cost?
4. If a gallon of oil costs 12 ct., how much does 1 qt. cost?

DRY MEASURE

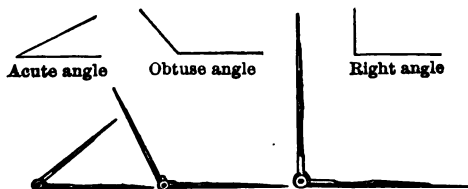
5. At 10 ct. a peck, how much will 1 bu. of potatoes cost? (Four 10's are how many?)
6. How many quarts in a peck? 1 qt. is what part of 1 pk.?
7. How many pecks in a bushel? 1 pk. is what part of 1 bu.?
8. If you gather 4 qt. of nuts on one day, and 3 qt. the next, and 1 qt. the next, how many pecks will you have?

WRITTEN EXERCISE

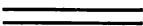
1. 2 pt. + 3 pt. + 5 pt. = how many pints? how many quarts?
2. 2 times 4 qt. = how many quarts? how many gallons?
3. How much is $\frac{1}{2}$ of 20 bu.? $\frac{1}{4}$ of 40 gal.?

ORAL EXERCISE

1. Compasses are used for drawing what figures?
In the picture they are open at what kinds of angles?



2. See if you can find in the room two lines which make a right angle.
3. When do the hands of a clock make a right angle? an acute angle? an obtuse angle?

Lines drawn like these, so as not to meet,  however long we make them, are called *parallel lines*.

4. See if you can find in the room two parallel lines.

PAPER FOLDING

1. Fold a 2-in. strip of paper to show $\frac{1}{2}$ of it.
2. Fold a 4-in. strip of paper to show $\frac{1}{2}$ of it; $\frac{1}{4}$ of it; $\frac{1}{8}$ of it.
3. Cut a square from paper. Fold it to show $\frac{1}{2}$ of one of its angles; $\frac{1}{4}$ of one of its angles.
4. Fold the paper so as to show 2 parallel lines. Fold again to show 3 parallel lines.
5. Fold the paper to make an obtuse angle. Fold again to make $\frac{1}{2}$ of this angle. This is what kind of angle?

ORAL EXERCISE

1. What time is it now by the clock?
2. How many minutes does it take the minute hand to go once around?
3. What month is this? What was last month? What is next month? Name the months of the year. Name the days of the week.
4. Do you know how many seconds make 1 minute? How many minutes make 1 hour? How many hours make 1 day? How many days make 1 week?

You have learned that

60 seconds (sec.) = 1 minute (min.).

60 minutes = 1 hour (hr.).

24 hours = 1 day (da.).

7 days = 1 week (wk.).

Four months have 30 days each.

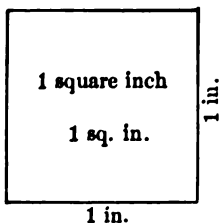
Thirty days hath September,
April, June, and November.

February has 28 days except in leap year, when it has 29 days. The other months have 31 days.

WRITTEN EXERCISE

1. 5 da. + 2 da. = how many days?
2. 2 times 30 sec. = how many seconds? minutes?
3. 40 sec. + 20 sec. = how many seconds? minutes?
4. Write the day of the week, the month, and the day of the month; thus: Thursday, April 23.

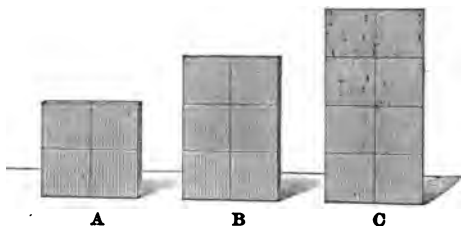
ORAL EXERCISE



1. A square that is 1 in. on a side is called by what name?

2. The area of such a square is 1 square inch. What is the area of an oblong 1 in. high and 2 in. long? 1 in. high and $\frac{1}{2}$ in. long?

3. The picture shows some piles of 1-in. blocks. How many square inches do you see in A? in B? in C?



4. What is the area of an oblong 2 in. high by 2 in. wide (see A)? of one 3 in. by 2 in.? of one 4 in. by 2 in.?

5. What is the area of an oblong 2 in. by 5 in.?

6. What do you mean by a square foot?

We write sq. in. for square inch, and sq. ft. for square foot.

WRITTEN EXERCISE

1. Copy and write the results:

2×3 times 1 sq. in. 2×5 times 1 sq. ft.

3×10 times 1 sq. in. 1×25 times 1 sq. ft.

2. Draw a picture of an oblong 2 in. by 5 in., using $\frac{1}{2}$ in. for 1 in. in your drawing.

ORAL EXERCISE

1. This strip of land is 10 ft. wide, the grass on the left is 1 ft. wide, and the hedge on the right is 2 ft. wide. How wide is the garden?

2. These children put a walk 1 ft. wide through the middle of the garden. What width was left for the flower beds? How wide was each bed?



3. The strip was 80 ft. long, and they divided this into 8 equal parts. How long was each?

4. They then cut each part into 2 equal parts for beds. How long was each of these parts?

5. They cut 1 ft. from the length of each bed for cross walks. How long did this leave each bed?

6. The beds are now 4 ft. long and 3 ft. wide. How many square feet in each?

7. Mabel makes a violet bed 10 in. long and 7 in. wide. How many square inches does it contain?

8. How many inches of string will it take to go around Mabel's violet bed? How many feet will it take to go around her whole bed, which is 4 ft. long and 3 ft. wide?

COUNTING BY VARIOUS NUMBERS

ORAL EXERCISE

1. If there are 5 peas in each pod, how many in 2 pods?



2. How many in 3 pods? in 4 pods? in 5 pods?

3. Write the 5's in columns, on the blackboard, to ten 5's. (Five such are shown here.) Tell the sums rapidly, beginning at the left.

4. Looking at the columns in Ex. 3, 5 is $\frac{1}{2}$ of what number? $\frac{1}{4}$ of what number? 10 is twice what number?

					5
				5	5
			5	5	5
		5	5	5	5
5	5	5	5	5	5

5. Look again at the columns and give some examples about numbers being $\frac{1}{2}$ or $\frac{1}{3}$ of other numbers.

6. Count by 5's from 5 to 100 and back again. Do you notice how this pendulum seems to swing from 0 to 5 and back each time?

The basis of rapid work with numbers is rapid counting. Upon it rest addition and the multiplication tables, with their inverses, subtraction and division.

0	5
10	15
20	25
30	35

ORAL EXERCISE

1. Count the cubes by columns, thus: 5, 10, 15, and so on. Count them by horizontal lines, by 10's, and see if you have the same number.



2. If torpedoes cost 5 ct. a package, how many packages can you buy for 20 ct.? How many 5's in 20?

3. Some children made these little wigwams, using a piece of muslin 1 ft. square for each. How many square feet were used for all?



4. How many square feet would be needed for 4 times as many wigwams?

5. If the muslin costs 2 ct. a square foot, how much will the 5 sq. ft. used for the wigwams in the picture cost?

ORAL EXERCISE

1. Count by 5's from 5 to 50. Count again, saying, "One 5 is 5, two 5's are 10, three 5's are 15," and so on.

2. Count in this way: "In 5 there is one 5, in 10 there are two 5's, in 15 there are three 5's," and so on to 50.

3. How much is $5 + 5 + 5$? $3 + 3 + 3 + 3 + 3$?
How many are three 5's? five 3's?

4. Tell the value of each of the following:

1×5	5×1	6×5	5×6
2×5	5×2	7×5	5×7
3×5	5×3	8×5	5×8
4×5	5×4	9×5	5×9
5×5	5×5	10×5	5×10

These tables and the tables in Ex. 6, having been developed by counting, should be thoroughly memorized, and, like all such tables, be made the subject of constant rapid review. The fives being easiest are taken first.

5. How much is $5 + 5 + 5 + 5$? $4 + 4 + 4 + 4 + 4$?
 4×5 ? 5×4 ? How many 5's in 20? How many 4's in 20?

6. Tell the value of each of the following:

$5 \div 5$	$5 \div 1$	$30 \div 5$	$30 \div 6$
$10 \div 5$	$10 \div 2$	$35 \div 5$	$35 \div 7$
$15 \div 5$	$15 \div 3$	$40 \div 5$	$40 \div 8$
$20 \div 5$	$20 \div 4$	$45 \div 5$	$45 \div 9$
$25 \div 5$	$25 \div 5$	$50 \div 5$	$50 \div 10$

ORAL EXERCISE

1. In the picture how many groups of 2 cubes each?



2. Count the cubes by 2's, thus: 2, 4, 6, 8, 10, to 20.

3. How many pairs of eyes are looking at me?
How many eyes?

4. How many pairs of ears are listening to me?
How many ears?

5. How many pairs of hands are on the desks?
How many hands?

6. Write on the blackboard
and add columns of 2's as far
as ten 2's. Here are 5 such
columns.

2	2	2	2	2
2	2	2	2	2
2	2	2	2	2
2	2	2	2	2

7. Look at the columns. $\underline{2}$ $\underline{2}$ $\underline{2}$ $\underline{2}$ $\underline{2}$
2 is $\frac{1}{2}$ of what number? $\frac{1}{3}$ of
what number? $\frac{1}{4}$ of what number?

8. How many 2's in 4? in 8? in 10? How
many 2-ct. stamps can you buy for 10 ct.?

9. Count by 2's, beginning with 1, thus: 1, 3,
5, 7, 9, to 21.

In the review drills this should be carried to 99.

Just as $\frac{1}{2}$ of 4 means $4 \div 2$, and $\frac{1}{3}$ of 9 means $9 \div 3$,
so $10 \div 5$ may be written $\frac{1}{5}$ of 10, $12 \div 6$ may be written
 $\frac{1}{6}$ of 12, and so on.

ORAL EXERCISE

1. Count by 2's from 2 to 20. Count again, saying, "One 2 is 2, two 2's are 4, three 2's are 6," and so on.

2. Count in this way: "In 2 there is one 2, in 4 there are two 2's, in 6 there are three 2's," and so on to 20.

3. How much is $2 + 2 + 2$? $3 + 3$? Compare 3×2 and 2×3 . How many 2's in 6? How many 3's in 6?

4. State rapidly the value of each of the following:

1×2	2×1	6×2	2×6
2×2	2×2	7×2	2×7
3×2	2×3	8×2	2×8
4×2	2×4	9×2	2×9
5×2	2×5	10×2	2×10

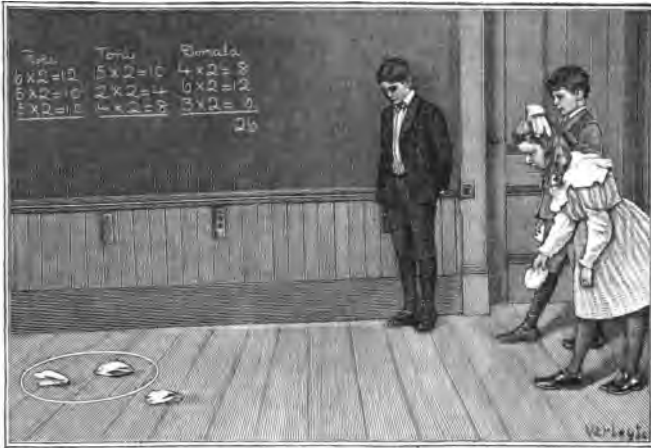
Memorize the tables found in Exs. 4 and 5.

5. State rapidly the value of each of the following:

$2 \div 2$	$2 \div 1$	$12 \div 2$	$12 \div 6$
$4 \div 2$	$4 \div 2$	$14 \div 2$	$14 \div 7$
$6 \div 2$	$6 \div 3$	$16 \div 2$	$16 \div 8$
$8 \div 2$	$8 \div 4$	$18 \div 2$	$18 \div 9$
$10 \div 2$	$10 \div 5$	$20 \div 2$	$20 \div 10$

WRITTEN EXERCISE

Copy Exs. 4 and 5 above and write the answers.



ORAL EXERCISE

The children played bean bag to-day. Each bag thrown into the circle counted 2. Each child had 6 bags.

1. The first time Rose tried she threw all of the bags into the circle. How much did that count?
2. The second time she threw all but one in, and the third time the same. What was her score?
3. Tony threw in 5 the first time, 2 the second, and 4 the third. What was his score?
4. Donald threw in 4 the first time, 6 the second, and 3 the third. What was his score?
5. The next time Rose threw in 5, 3, and 4; Tony, 2, 6, and 4; Donald, 6, 6, and 0. Let us write their scores on the blackboard and see who won.

ORAL EXERCISE

1. In the picture how many groups of 3 firecrackers each? How many firecrackers in 2 groups? How many are two 3's?



2. How many in 3 groups? How many are three 3's? How many are four 3's? five 3's?

3. Write on the blackboard columns of 3's as far as ten 3's.

Here are five such columns.

Add those on the board.

4. Count by 3's, thus: 3, 6, 9, 12, and so on to 30.

				3
			3	3
		3	3	3
	3	3	3	3
<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>

5. From these columns you see that 3 is $\frac{1}{2}$ of what number? $\frac{1}{3}$ of what number? $\frac{1}{4}$ of what number? $\frac{1}{5}$ of what number?

6. How many 3's do you see in 9? in a dozen?

7. How many feet in 1 yd.? in 3 yd.? in 5 yd.?

8. If each of 5 boys has 3 ct., how much have they all?

9. If each of 7 boys has 3 marbles, how many have they all?

10. At 3 ct. each, how many pencils can be bought for 9 ct.? 15 ct.? 21 ct.?

In review drills, count by 3's beginning with 1.

ORAL EXERCISE

1. Count by 3's from 3 to 30. Count again, saying, "One 3 is 3, two 3's are 6," and so on.

2. Count in this way: "In 3 there is one 3, in 6 there are two 3's, in 9 there are three 3's," and so on to 30.

3. State rapidly and memorize the value of each:

1×3	3×1	6×3	3×6
2×3	3×2	7×3	3×7
3×3	3×3	8×3	3×8
4×3	3×4	9×3	3×9
5×3	3×5	10×3	3×10

4. State rapidly and memorize the value of each:

$3 \div 3$	$3 \div 1$	$18 \div 3$	$18 \div 6$
$6 \div 3$	$6 \div 2$	$21 \div 3$	$21 \div 7$
$9 \div 3$	$9 \div 3$	$24 \div 3$	$24 \div 8$
$12 \div 3$	$12 \div 4$	$27 \div 3$	$27 \div 9$
$15 \div 3$	$15 \div 5$	$30 \div 3$	$30 \div 10$

5. State rapidly these sums and differences:

$3 + 0$	$3 - 3$	$3 + 10$	$13 - 3$
$3 + 2$	$5 - 3$	$3 + 12$	$15 - 3$
$3 + 4$	$7 - 3$	$3 + 84$	$87 - 3$
$3 + 6$	$9 - 3$	$3 + 7$	$10 - 3$
$3 + 9$	$12 - 3$	$3 + 19$	$22 - 3$

WRITTEN EXERCISE

Copy Exs. 3 and 4 above and write the answers.

ORAL EXERCISE

1. In the picture how many columns of 4 squares each? How many squares in 2 columns? in 3 columns? How many are two 4's? three 4's?



2. Write on the blackboard and add the columns of 4's as far as ten 4's. (See the columns of 3's on page 66.)

3. Count by 4's, thus: 4, 8, 12, 16, and so on to 40.

4. From the columns on the blackboard you see that 4 is $\frac{1}{2}$ of what number? $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$ of what numbers?

5. How many 4's do you see in 8? in 12? in 16? in 32?

6. If each of 5 boys has 4 ct., how many cents have they all?

7. How many 25-ct. pieces in \$1? How many in \$4?

8. How many quarts in 1 gal.? How many in 5 gal.? in 7 gal.?

9. If 4 ct. pays for 1 yd. of ribbon, how many yards can be bought for 20 ct.? for 36 ct.?

10. If 4 ct. pays for 1 yd. of ribbon, what is the cost of 5 yd.? of 6 yd.? of 9 yd.? of 8 yd.? of 10 yd.?

ORAL EXERCISE

1. Count by 4's from 4 to 40. Count again, saying, "One 4 is 4, two 4's are 8," and so on.

2. Count in this way: "In 4 there is one 4, in 8 there are two 4's, in 12 there are three 4's," and so on to 40.

3. State rapidly and memorize the value of each:

1×4	4×1	6×4	4×6
2×4	4×2	7×4	4×7
3×4	4×3	8×4	4×8
4×4	4×4	9×4	4×9
5×4	4×5	10×4	4×10

4. State rapidly and memorize the value of each:

$4 \div 4$	$4 \div 1$	$24 \div 4$	$24 \div 6$
$8 \div 4$	$8 \div 2$	$28 \div 4$	$28 \div 7$
$12 \div 4$	$12 \div 3$	$32 \div 4$	$32 \div 8$
$16 \div 4$	$16 \div 4$	$36 \div 4$	$36 \div 9$
$20 \div 4$	$20 \div 5$	$40 \div 4$	$40 \div 10$

Teachers should give abundant drill on all such tables, asking for products and quotients in irregular order.

5. State rapidly these sums and differences:

$4 + 2$	$6 - 4$	$6 - 2$	$4 + 7$	$11 - 4$	$11 - 7$
$4 + 4$	$8 - 4$	$8 - 4$	$4 + 9$	$13 - 4$	$13 - 9$
$4 + 5$	$9 - 4$	$9 - 5$	$4 + 10$	$14 - 4$	$14 - 10$

WRITTEN EXERCISE

Copy Exs. 3 and 4 above and write the answers.

REVIEW OF THE TABLES

You have now learned how to add any two numbers of one figure each. There are 45 ways in which you can put two such numbers together, and you know them.

2	3	4	5	6	7	8	9	
1 + 1	1 + 2	1 + 3	1 + 4	1 + 5	1 + 6	1 + 7	1 + 8	
		2 + 2	2 + 3	2 + 4	2 + 5	2 + 6	2 + 7	
				3 + 3	3 + 4	3 + 5	3 + 6	
						4 + 4	4 + 5	
10	11	12	13	14	15	16	17	18
1 + 9	2 + 9	3 + 9	4 + 9	5 + 9	6 + 9	7 + 9	8 + 9	9 + 9
2 + 8	3 + 8	4 + 8	5 + 8	6 + 8	7 + 8	8 + 8		
3 + 7	4 + 7	5 + 7	6 + 7	7 + 7				
4 + 6	5 + 6	6 + 6						
5 + 5								

The following table also shows the sum of the left-hand number and top number.

	1=	2=	3=	4=	5=	6=	7=	8=	9=
1+	2	3	4	5	6	7	8	9	10
2+	3	4	5	6	7	8	9	10	11
3+	4	5	6	7	8	9	10	11	12
4+	5	6	7	8	9	10	11	12	13
5+	6	7	8	9	10	11	12	13	14
6+	7	8	9	10	11	12	13	14	15
7+	8	9	10	11	12	13	14	15	16
8+	9	10	11	12	13	14	15	16	17
9+	10	11	12	13	14	15	16	17	18

MULTIPLICATION AND DIVISION TABLES 77

You have also learned how to multiply and divide certain numbers.

1×2 or $2 \times 1 = 2$	$2 + 2 = 4$	$2 \div 1 = 2$
$2 \times 2 = 4$	$4 + 2 = 6$	$4 \div 2 = 2$
3×2 or $2 \times 3 = 6$	$6 + 2 = 8$	$6 \div 3 = 2$
4×2 or $2 \times 4 = 8$	$8 + 2 = 10$	$8 \div 4 = 2$
5×2 or $2 \times 5 = 10$	$10 + 2 = 12$	$10 \div 5 = 2$
6×2 or $2 \times 6 = 12$	$12 + 2 = 14$	$12 \div 6 = 2$
7×2 or $2 \times 7 = 14$	$14 + 2 = 16$	$14 \div 7 = 2$
8×2 or $2 \times 8 = 16$	$16 + 2 = 18$	$16 \div 8 = 2$
9×2 or $2 \times 9 = 18$	$18 + 2 = 20$	$18 \div 9 = 2$
10×2 or $2 \times 10 = 20$	$20 + 2 = 22$	$20 \div 10 = 2$
1×3 or $3 \times 1 = 3$	$3 + 3 = 6$	$3 \div 1 = 3$
2×3 or $3 \times 2 = 6$	$6 + 3 = 9$	$6 \div 2 = 3$
$3 \times 3 = 9$	$9 + 3 = 12$	$9 \div 3 = 3$
4×3 or $3 \times 4 = 12$	$12 + 3 = 15$	$12 \div 4 = 3$
5×3 or $3 \times 5 = 15$	$15 + 3 = 18$	$15 \div 5 = 3$
6×3 or $3 \times 6 = 18$	$18 + 3 = 21$	$18 \div 6 = 3$
7×3 or $3 \times 7 = 21$	$21 + 3 = 24$	$21 \div 7 = 3$
8×3 or $3 \times 8 = 24$	$24 + 3 = 27$	$24 \div 8 = 3$
9×3 or $3 \times 9 = 27$	$27 + 3 = 30$	$27 \div 9 = 3$
10×3 or $3 \times 10 = 30$	$30 + 3 = 33$	$30 \div 10 = 3$

The multiplication tables thus far learned, with the accompanying results of division, are here given for the convenience of the teacher in arranging reviews, and that the pupils may be assisted in visualizing results. For oral work the teacher should not usually ask for products or quotients in the order given by the tables.

1×4 or $4 \times 1 = 4$	$4 + 4 = 1$	$4 + 1 = 4$
2×4 or $4 \times 2 = 8$	$8 + 4 = 2$	$8 + 2 = 4$
3×4 or $4 \times 3 = 12$	$12 + 4 = 3$	$12 + 3 = 4$
$4 \times 4 = 16$	$16 + 4 = 4$	$16 + 4 = 4$
5×4 or $4 \times 5 = 20$	$20 + 4 = 5$	$20 + 5 = 4$
6×4 or $4 \times 6 = 24$	$24 + 4 = 6$	$24 + 6 = 4$
7×4 or $4 \times 7 = 28$	$28 + 4 = 7$	$28 + 7 = 4$
8×4 or $4 \times 8 = 32$	$32 + 4 = 8$	$32 + 8 = 4$
9×4 or $4 \times 9 = 36$	$36 + 4 = 9$	$36 + 9 = 4$
10×4 or $4 \times 10 = 40$	$40 + 4 = 10$	$40 + 10 = 4$
1×5 or $5 \times 1 = 5$	$5 + 5 = 1$	$5 + 1 = 5$
2×5 or $5 \times 2 = 10$	$10 + 5 = 2$	$10 + 2 = 5$
3×5 or $5 \times 3 = 15$	$15 + 5 = 3$	$15 + 3 = 5$
4×5 or $5 \times 4 = 20$	$20 + 5 = 4$	$20 + 4 = 5$
$5 \times 5 = 25$	$25 + 5 = 5$	$25 + 5 = 5$
6×5 or $5 \times 6 = 30$	$30 + 5 = 6$	$30 + 6 = 5$
7×5 or $5 \times 7 = 35$	$35 + 5 = 7$	$35 + 7 = 5$
8×5 or $5 \times 8 = 40$	$40 + 5 = 8$	$40 + 8 = 5$
9×5 or $5 \times 9 = 45$	$45 + 5 = 9$	$45 + 9 = 5$
10×5 or $5 \times 10 = 50$	$50 + 5 = 10$	$50 + 10 = 5$

WRITTEN EXERCISE

1. Make 15 dots so as to show that there are three 5's in 15, and five 3's in 15.
2. Draw 6 squares so as to show that 2×3 is the same number as 3×2 .
3. Make 12 dots so as to show that 3×4 is the same number as 4×3 .
4. Make 10 dots so as to show that there are two 5's in 10, and five 2's in 10.

ADDITION

We see by this example that we may *add each column separately and then add the sums.*

Learn to read the columns like words. 34

When you see $7 + 4$, think simply 11. 47

To be sure that your answer is right, 11 sum of units
to check it as we say, add in the other 7 “ “ tens
direction, that is, from the top down, 81 total sum
if you first added upwards.

WRITTEN EXERCISE

Add the following:

- | | | | | |
|---|---|---|---|---|
| 1. $\begin{array}{r} 27 \\ 38 \\ \hline \end{array}$ | 2. $\begin{array}{r} 26 \\ 49 \\ \hline \end{array}$ | 3. $\begin{array}{r} 39 \\ 48 \\ \hline \end{array}$ | 4. $\begin{array}{r} 56 \\ 18 \\ \hline \end{array}$ | 5. $\begin{array}{r} 35 \\ 45 \\ \hline \end{array}$ |
| 6. $\begin{array}{r} 12 \\ 23 \\ 46 \\ \hline \end{array}$ | 7. $\begin{array}{r} 33 \\ 28 \\ 31 \\ \hline \end{array}$ | 8. $\begin{array}{r} 27 \\ 13 \\ 36 \\ \hline \end{array}$ | 9. $\begin{array}{r} 42 \\ 28 \\ 13 \\ \hline \end{array}$ | 10. $\begin{array}{r} 57 \\ 6 \\ 20 \\ \hline \end{array}$ |
| 11. $\begin{array}{r} 31 \\ 41 \\ 22 \\ 34 \\ \hline \end{array}$ | 12. $\begin{array}{r} 22 \\ 30 \\ 63 \\ 74 \\ \hline \end{array}$ | 13. $\begin{array}{r} 80 \\ 90 \\ 27 \\ 42 \\ \hline \end{array}$ | 14. $\begin{array}{r} 34 \\ 23 \\ 40 \\ 50 \\ \hline \end{array}$ | 15. $\begin{array}{r} 63 \\ 41 \\ 32 \\ 70 \\ \hline \end{array}$ |
| 16. $\begin{array}{r} 11 \\ 21 \\ 32 \\ 41 \\ 70 \\ \hline \end{array}$ | 17. $\begin{array}{r} 60 \\ 22 \\ 35 \\ 40 \\ 21 \\ \hline \end{array}$ | 18. $\begin{array}{r} 76 \\ 20 \\ 31 \\ 40 \\ 21 \\ \hline \end{array}$ | 19. $\begin{array}{r} 43 \\ 21 \\ 32 \\ 41 \\ 11 \\ \hline \end{array}$ | 20. $\begin{array}{r} 30 \\ 33 \\ 23 \\ 13 \\ 30 \\ \hline \end{array}$ |

ORAL EXERCISE

State the sums rapidly. Do not repeat the numbers to be added.

1. 7	2. 27	3. 27	4. 27	5. 37
<u>4</u>	<u>4</u>	<u>14</u>	<u>24</u>	<u>34</u>

In oral work, children should add 27 to 14 by thinking $27 + 4 = 31$, $31 + 10 = 41$, or $27 + 10 = 37$, $37 + 4 = 41$. Much oral work of this kind should be given. Explanations like the following should be placed on the blackboard.

You have now found that you need not stop to write the sum of each column, as on page 79.

You may think this:

$$\begin{array}{r}
 35 \\
 28 \\
 \hline
 13 \text{ sum of units} \\
 50 \text{ " " tens} \\
 \hline
 63 \text{ sum}
 \end{array}$$

But write only this:

$$\begin{array}{r}
 35. \\
 28 \\
 \hline
 63
 \end{array}$$

In this example you look at 8 and 5, and think 13. Then you write the 3 in units' place and add the 1 ten to the tens' column. The tens are then $1 + 2 + 3 = 6$.

WRITTEN EXERCISE

Add the following:

1. 42	2. 73	3. 29	4. 36	5. 48
<u>38</u>	<u>18</u>	<u>39</u>	<u>27</u>	<u>29</u>
6. 256	7. 329	8. 635	9. 725	10. 807
<u>127</u>	<u>438</u>	<u>125</u>	<u>106</u>	<u>153</u>

ORAL EXERCISE

- | | | | |
|------------|---------------------|---------------------|------------|
| 1. 352 | 2. 300 + 50 + 2 | 3. 300 + 50 + 6 | 4. 356 |
| <u>224</u> | <u>200 + 20 + 4</u> | <u>200 + 20 + 4</u> | <u>224</u> |

These examples should be written on the blackboard, the children reciting orally. See the note on page 80.

As with numbers of two figures,

You may think this:

But write only this:

384
257
 11 sum of units
 130 " " tens
 500 " " hundreds
641 sum

384
257
 641

You look at 7 and 4, and think 11. Then you write the 1 in units' place, and add the 1 ten to the tens' column. The tens are then $1 + 5 + 8 = 14$. Then you write the 4 in tens' place and add the 1 to the hundreds' column. The hundreds are then $1 + 2 + 3 = 6$.

WRITTEN EXERCISE

Add the following:

- | | | | |
|------------|------------|------------|------------|
| 1. 122 | 2. 125 | 3. 155 | 4. 265 |
| <u>347</u> | <u>348</u> | <u>348</u> | <u>348</u> |
| 5. 298 ft. | 6. 400 | 7. 201 | 8. \$374 |
| 107 | 102 | 507 | 385 |
| 206 | 70 | 92 | 62 |
| <u>101</u> | <u>99</u> | <u>61</u> | <u>101</u> |

WRITTEN EXERCISE

Add in Exs. 1-10:

1. 132	2. 209	3. 122	4. 302	5. 122
227	108	231	47	129
342	301	327	509	324
<u>135</u>	<u>250</u>	<u>152</u>	<u>51</u>	<u>150</u>
6. 223	7. 102	8. 200	9. 350	10. 230
47	75	37	107	30
142	327	47	150	40
31	22	122	103	9
<u>21</u>	<u>401</u>	<u>31</u>	<u>200</u>	<u>109</u>

11. If Fred picks 225 apples, Frank 235, and Rob 236, how many do they all pick?

Make problems for Exs. 12-26, and find the answers:

12. $235 + 475 + 60$. 13. $125 + 75 + 300$.
 14. $240 + 40 + 608$. 15. $325 + 25 + 250$.
 16. $\$175 + \$50 + \$75$. 17. $\$350 + \$350 + \$200$.
 18. $\$250 + \$350 + \$50$. 19. $\$225 + \$225 + \$250$.
 20. $325 \text{ ft.} + 40 \text{ ft.} + 75 \text{ ft.}$
 21. $600 \text{ ft.} + 82 \text{ ft.} + 79 \text{ ft.}$
 22. $427 \text{ yd.} + 23 \text{ yd.} + 50 \text{ yd.}$
 23. $328 \text{ yd.} + 37 \text{ yd.} + 39 \text{ yd.}$
 24. $4 \text{ lb.} + 9 \text{ lb.} + 73 \text{ lb.} + 68 \text{ lb.}$
 25. $56 \text{ lb.} + 72 \text{ lb.} + 68 \text{ lb.} + 49 \text{ lb.}$
 26. $63 \text{ lb.} + 59 \text{ lb.} + 67 \text{ lb.} + 58 \text{ lb.}$

WRITTEN EXERCISE

Add:

1. 223	2. 121	3. 102	4. 320	5. 221
37	306	302	25	322
123	250	55	75	37
203	127	23	30	42
61	32	31	400	13
<u>311</u>	<u>121</u>	<u>232</u>	<u>105</u>	<u>201</u>

6. 92	7. 82	8. 22	9. 23	10. 42	11. 34
23	31	33	35	62	60
42	22	23	42	13	75
27	19	44	52	19	25
13	32	25	63	52	12
<u>11</u>	<u>13</u>	<u>81</u>	<u>11</u>	<u>31</u>	<u>32</u>

12. $325 + 144$. 13. $347 + 279$. 14. $352 + 179$.

15. $237 + 473$. 16. $395 + 295$. 17. $406 + 499$.

18. $328 + 376$. 19. $245 + 259$. 20. $307 + 498$.

21. $62 + 98 + 179$. 22. $35 + 49 + 675$.

23. $28 + 43 + 596$. 24. $87 + 50 + 509$.

25. $75 + 75 + 175$. 26. $86 + 98 + 344$.

27. $\$675 + \$87 + \$21$. 28. $\$243 + \$95 + \$327$.

29. $\$86 + \$9 + \$772$.

30. $46 \text{ in.} + 98 \text{ in.} + 21 \text{ in.}$

31. $28 \text{ qt.} + 39 \text{ qt.} + 62 \text{ qt.}$

32. $221 \text{ ft.} + 87 \text{ ft.} + 65 \text{ ft.}$

33. $306 \text{ ft.} + 85 \text{ ft.} + 32 \text{ ft.}$

34. $227 \text{ ft.} + 49 \text{ ft.} + 353 \text{ ft.}$

35. $43 \text{ yd.} + 37 \text{ yd.} + 21 \text{ yd.}$

SUBTRACTION

ORAL EXERCISE

1. $\begin{array}{r} 8 \\ 2 \\ \hline \end{array}$	2. $\begin{array}{r} 18 \\ 2 \\ \hline \end{array}$	3. $\begin{array}{r} 48 \\ 12 \\ \hline \end{array}$	4. $\begin{array}{r} 357 \\ 12 \\ \hline \end{array}$	5. $\begin{array}{r} 357 \\ 123 \\ \hline \end{array}$
6. $\begin{array}{r} 98 \\ 73 \\ \hline \end{array}$	7. $\begin{array}{r} 69 \\ 42 \\ \hline \end{array}$	8. $\begin{array}{r} 75 \\ 25 \\ \hline \end{array}$	9. $\begin{array}{r} 225 \\ 25 \\ \hline \end{array}$	10. $\begin{array}{r} 475 \\ 150 \\ \hline \end{array}$

The above are types of examples to be written on the black-board, the children reciting orally.

11. What number must be added to 15 to make 20? to 15 to make 25? to 75 to make 100?

12. Which is larger, the sum of two numbers or one of the numbers? How much larger? Think of $4 + 5 = 9$.

In subtracting $47 - 23 = 24$,

47 is called the *minuend*,

23 “ “ “ *subtrahend*,

24 “ “ “ *difference* or *remainder*.

Teachers will see the advantage of following the method of subtraction in use in the other classes in the school, so as to avoid confusing children. Either of the following is satisfactory, the first being the quicker.

1. 3 and 4 are 7; 2 and 2 are 4. Write the 24.

2. 3 from 7 are 4; 2 from 4 are 2. Write the 24.

The pupils should be required to check results by adding the difference and the subtrahend.

It is often necessary in a text-book to present a considerable amount of abstract work on consecutive pages. Teachers, however, should daily give practical problems from the children's life of the types found throughout this book.

ORAL EXERCISE

$$\begin{array}{r} 1. \quad 400 + 110 + 13 \\ \quad 100 + 50 + 4 \\ \hline \end{array} \qquad \begin{array}{r} 2. \quad 600 + 130 + 11 \\ \quad 200 + 50 + 2 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 300 + 120 + 15 \\ \quad 100 + 30 + 9 \\ \hline \end{array} \qquad \begin{array}{r} 4. \quad 800 + 150 + 10 \\ \quad 600 + 80 + 5 \\ \hline \end{array}$$

See the note on page 80 as to this work.

You have here subtracted numbers of 3 figures by separating them. In subtracting 154 from 523,

You may think this: *But write only this:*

$$\begin{array}{r} 400 + 110 + 13 \\ 100 + 50 + 4 \\ \hline 300 + 60 + 9 \end{array} \qquad \begin{array}{r} 523 \\ 154 \\ \hline 369 \end{array}$$

The pupil may think either

1. 4 and 9 are 13; 5 (tens) and 6 are 11 (or 6 and 6 are 12); 1 and 3 are 4 (or 2 and 3 are 5). Write 369.
2. Or, 4 from 13, 9; 5 (tens) from 11, 6; 1 from 4, 3.

WRITTEN EXERCISE

Subtract, separating only in Exs. 1 and 2:

$$\begin{array}{r} 1. \quad 236 = 200 + 20 + 16 \\ \quad 127 = 100 + 20 + 7 \\ \hline \end{array} \qquad \begin{array}{r} 2. \quad 431 = 400 + 20 + 11 \\ \quad 229 = 200 + 20 + 9 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad \$346 \\ \quad 209 \\ \hline \end{array} \qquad \begin{array}{r} 4. \quad 487 \text{ ft.} \\ \quad 192 \\ \hline \end{array} \qquad \begin{array}{r} 5. \quad 346 \text{ min.} \\ \quad 157 \\ \hline \end{array}$$

$$6. \quad 326 - 134. \qquad 7. \quad 420 - 140. \qquad 8. \quad 342 - 168.$$

$$9. \quad 900 - 206. \qquad 10. \quad 342 - 127. \qquad 11. \quad 680 - 469.$$

WRITTEN EXERCISE

1. $243 - 26$. 2. $327 - 63$. 3. $492 - 96$.
4. $627 - 29$. 5. $346 - 66$. 6. $821 - 32$.
7. $593 - 287$. 8. $609 - 590$. 9. $341 - 143$.
10. $623 - 129$. 11. $648 - 249$. 12. $273 - 164$.
13. $592 - 293$. 14. $407 - 328$. 15. $621 - 269$.
16. $821 - 327$. 17. $360 - 172$. 18. $731 - 235$.
19. $732 - 648$. 20. $500 - 419$. 21. $800 - 635$.
22. $\$204 - \68 . 23. $\$325 - \75 . 24. $\$750 - \175 .
25. $300 \text{ ft.} - 67 \text{ ft.}$ 26. $225 \text{ ft.} - 70 \text{ ft.}$
27. $340 \text{ yd.} - 85 \text{ yd.}$ 28. $285 \text{ yd.} - 98 \text{ yd.}$
29. $307 \text{ min.} - 39 \text{ min.}$ 30. $250 \text{ ft.} - 198 \text{ ft.}$
31. If Ned had 850 ft. of kite string and lost 69 ft. in a tree, how many feet had he left?

Make problems for Exs. 32-43, and find the answers:

- | | | | | |
|---|---|---|---|---|
| 32. $\begin{array}{r} 700 \\ 95 \\ \hline \end{array}$ | 33. $\begin{array}{r} 820 \\ 75 \\ \hline \end{array}$ | 34. $\begin{array}{r} 650 \\ 80 \\ \hline \end{array}$ | 35. $\begin{array}{r} 295 \\ 96 \\ \hline \end{array}$ | 36. $\begin{array}{r} 745 \\ 37 \\ \hline \end{array}$ |
| 37. $\begin{array}{r} 925 \\ 367 \\ \hline \end{array}$ | 38. $\begin{array}{r} 871 \\ 293 \\ \hline \end{array}$ | 39. $\begin{array}{r} 482 \\ 193 \\ \hline \end{array}$ | 40. $\begin{array}{r} 520 \\ 175 \\ \hline \end{array}$ | 41. $\begin{array}{r} 630 \\ 182 \\ \hline \end{array}$ |
| 42. $\$825 - \268 . | | 43. $\$342 - \175 . | | |

First add the numbers in the parenthesis; then subtract:

- | | |
|--------------------------|--------------------------|
| 44. $635 - (75 + 132)$. | 45. $825 - (67 + 139)$. |
| 46. $462 - (73 + 246)$. | 47. $521 - (25 + 247)$. |
| 48. $762 - (32 + 167)$. | 49. $384 - (48 + 121)$. |

MULTIPLICATION

ORAL EXERCISE

1. $10 + 2$

$$\begin{array}{r} 5 \\ \hline * + * = * \end{array}$$

2. $10 + 8$

$$\begin{array}{r} 2 \\ \hline * + * = * \end{array}$$

3. $20 + 4$

$$\begin{array}{r} 3 \\ \hline * + * = * \end{array}$$

See the note on page 80 as to this work.

In multiplying 23 by 3,

23 is called the *multiplicand*,

3 “ “ “ *multiplier*,

69 “ “ “ *product*.

You have multiplied by separating the multiplicand into parts. You need not take the time to do this.

You may think this: Or this: But write only this:

$$20 + 7$$

$$\begin{array}{r} 3 \\ \hline 60 + 21 = 81 \end{array}$$

$$27$$

$$\begin{array}{r} 3 \\ \hline 21 \end{array} \text{ product of units}$$

$$60 \quad \text{“} \quad \text{“} \quad \text{tens}$$

$$81 \text{ total product}$$

$$27$$

$$\begin{array}{r} 3 \\ \hline 81 \end{array}$$

You should think 3 times 7 = 21. (Write the 1 in units' place.) 3 times 2 (tens) = 6 (tens), and 6 (tens) + 2 (tens) = 8 tens. (Write the 8 in tens' place.)

WRITTEN EXERCISE

Multiply:

1. 23 by 3.
2. 23 by 4.
3. 25 by 2.
4. 25 by 3.
5. 45 by 2.
6. 17 by 3.
7. 13 by 3.
8. 38 by 3.
9. 19 by 3.
10. 18 by 3.
11. 21 by 4.
12. 37 by 3.
13. 46 by 2.
14. 36 by 2.
15. 16 by 3.
16. 28 by 2.

WRITTEN EXERCISE

Multiply in Exs. 1-30:

1. $\begin{array}{r} 26 \\ 2 \\ \hline \end{array}$	2. $\begin{array}{r} 37 \\ 2 \\ \hline \end{array}$	3. $\begin{array}{r} 48 \\ 2 \\ \hline \end{array}$	4. $\begin{array}{r} 39 \\ 2 \\ \hline \end{array}$	5. $\begin{array}{r} 47 \\ 2 \\ \hline \end{array}$
---	---	---	---	---

6. $\begin{array}{r} 15 \\ 3 \\ \hline \end{array}$	7. $\begin{array}{r} 24 \\ 3 \\ \hline \end{array}$	8. $\begin{array}{r} 26 \\ 3 \\ \hline \end{array}$	9. $\begin{array}{r} 29 \\ 3 \\ \hline \end{array}$	10. $\begin{array}{r} 28 \\ 3 \\ \hline \end{array}$
---	---	---	---	--

11. $\begin{array}{r} 17 \\ 4 \\ \hline \end{array}$	12. $\begin{array}{r} 19 \\ 4 \\ \hline \end{array}$	13. $\begin{array}{r} 25 \\ 4 \\ \hline \end{array}$	14. $\begin{array}{r} 33 \\ 4 \\ \hline \end{array}$	15. $\begin{array}{r} 36 \\ 4 \\ \hline \end{array}$
--	--	--	--	--

16. $\begin{array}{r} 15 \\ 5 \\ \hline \end{array}$	17. $\begin{array}{r} 17 \\ 5 \\ \hline \end{array}$	18. $\begin{array}{r} 26 \\ 5 \\ \hline \end{array}$	19. $\begin{array}{r} 32 \\ 5 \\ \hline \end{array}$	20. $\begin{array}{r} 37 \\ 5 \\ \hline \end{array}$
--	--	--	--	--

21. $\begin{array}{r} 45 \\ 3 \\ \hline \end{array}$	22. $\begin{array}{r} 52 \\ 3 \\ \hline \end{array}$	23. $\begin{array}{r} 68 \\ 4 \\ \hline \end{array}$	24. $\begin{array}{r} 73 \\ 4 \\ \hline \end{array}$	25. $\begin{array}{r} 82 \\ 5 \\ \hline \end{array}$
--	--	--	--	--

26. $\begin{array}{r} 91 \\ 2 \\ \hline \end{array}$	27. $\begin{array}{r} 89 \\ 2 \\ \hline \end{array}$	28. $\begin{array}{r} 93 \\ 3 \\ \hline \end{array}$	29. $\begin{array}{r} 95 \\ 4 \\ \hline \end{array}$	30. $\begin{array}{r} 96 \\ 5 \\ \hline \end{array}$
--	--	--	--	--

31. How many wings have 35 robins?

32. What will 18 oranges cost at 5 ct. each?

Make problems for Exs. 33-42, and find the answers:

33. 3 times 44.

34. 4 times 33.

35. 5 times 62.

36. 2 times \$75.

37. 3 times \$55.

38. 4 times \$32.

39. 5 times 71 ft.

40. 4 times 25 ct.

41. 4 times 41 lb.

42. 3 times 33 yd.

ORAL EXERCISE

1. What is the value of the following?

$$3 + 3 \quad 2 + 2 + 2 \quad 2 \times 3 \quad 3 \times 2$$

$$4 + 4 + 4 \quad 3 + 3 + 3 + 3 \quad 3 \times 4 \quad 4 \times 3$$

Two 3's equal how many 2's? Three 4's equal how many 3's?

2. How many dots are there in each horizontal row? How many rows are there? $\bullet \bullet \bullet \bullet \bullet$
Then how many dots are there in all? $\bullet \bullet \bullet \bullet \bullet$

3. How many dots in each column? $\bullet \bullet \bullet \bullet \bullet$
How many columns are there? Then how many dots are there in all? What does this tell you about the values of 3×5 and 5×3 ?

4. Instead of multiplying 2 by 15, you may multiply 15 by what number? Instead of multiplying \$3 by 12, you may multiply \$12 by what number?

5. If one pair of shoes costs \$2, how much will 15 pairs cost? You can get the result by multiplying \$15 by what number?

WRITTEN EXERCISE

1. At \$2 each, how much will 17 books cost?
2. At \$4 each, how much will 24 tricycles cost?
3. If one hat costs \$3, how much will 14 such hats cost?
4. If one sled costs 75 ct., how many cents must be paid for two such sleds?

DIVISION

ORAL EXERCISE

State rapidly the results:

- | | | | |
|-------------------|---------------|-------------------|---------------|
| 1. $3 \times 4,$ | $12 \div 3.$ | 2. $3 \times 5,$ | $15 \div 3.$ |
| 3. $2 \times 7,$ | $14 \div 2.$ | 4. $2 \times 9,$ | $18 \div 2.$ |
| 5. $2 \times 60,$ | $120 \div 2.$ | 6. $3 \times 70,$ | $210 \div 3.$ |

To show that we divide 8 by 2 we may write:

$$\frac{1}{2} \text{ of } 8 = 4 \qquad 8 \div 2 = 4 \qquad \begin{array}{r} 2 \overline{)8} \\ 4 \end{array}$$

- | | | | |
|-------------------------|----------------------|---------------------------|-----------------------|
| 7. $3 \overline{)30+3}$ | $3 \overline{)30+6}$ | 8. $2 \overline{)40+4}$ | $2 \overline{)40+8}$ |
| 9. $2 \overline{)80+4}$ | $3 \overline{)90+6}$ | 10. $2 \overline{)120+6}$ | $3 \overline{)120+9}$ |

See the notes on pages 80 and 81.

In $21 \div 3 = 7$, 21, the number divided, is called the *dividend*; 3, the number by which we divide, is called the *divisor*; 7, the result, is called the *quotient*.

You may think this:

$$\begin{array}{r} 3 \overline{)30+6} \\ 10+2=12 \end{array}$$

But write only this:

$$\begin{array}{r} 3 \overline{)36} \\ 12 \end{array}$$

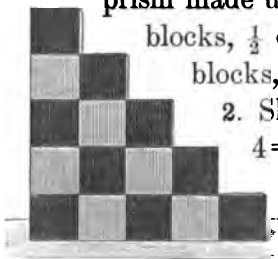
WRITTEN EXERCISE

- | | | |
|---------------------------|---------------------------|----------------------------------|
| 1. $63 \div 3.$ | 2. $48 \div 4.$ | 3. $88 \div 8.$ |
| 4. $68 \div 2.$ | 5. $96 \div 3.$ | 6. $55 \div 5.$ |
| 7. $248 \div 2.$ | 8. $464 \div 2.$ | 9. $844 \div 4.$ |
| 10. $448 \div 4.$ | 11. $550 \div 5.$ | 12. $505 \div 5.$ |
| 13. $639 \div 3.$ | 14. $309 \div 3.$ | 15. $966 \div 3.$ |
| 16. $\frac{1}{2}$ of 426. | 17. $\frac{1}{3}$ of 693. | 18. $\frac{1}{4}$ of 448. |
| 19. $\frac{1}{4}$ of 800. | 20. $\frac{1}{5}$ of 500. | 21. $\frac{1}{5}$ of 20; of 200. |

FRACTIONS

ORAL EXERCISE

1. Using real cubes or this picture, point to the prism made up of 5 blocks, $\frac{1}{5}$ of 5 blocks, 4 blocks, $\frac{1}{2}$ of 4 blocks, $\frac{1}{4}$ of 4 blocks, 3 blocks, $\frac{1}{3}$ of 3 blocks, $\frac{1}{2}$ of 2 blocks.



2. Show by the blocks that $\frac{1}{2}$ of 4 = twice $\frac{1}{4}$ of 4. If you have the real cubes, pile 6 of them and show that $\frac{1}{2}$ of 6 = 3 times $\frac{1}{3}$ of 6.

Cubes of this kind are commonly found in schools. The above is suggestive of work with various fractions, the arrangement in steps being particularly advantageous.

DRAWING EXERCISE

1. Draw a line 1 in. long. Mark off $\frac{1}{4}$ in. on this line.
2. Draw a line $1\frac{1}{2}$ in. long. Divide it into three equal parts. Write over each part its length.
3. Draw a line 3 in. long. Divide it into 6 equal parts. Show from this, by making $\frac{1}{3}$ of the line heavier, that $\frac{1}{3}$ = twice $\frac{1}{6}$.
4. Draw another line 3 in. long. Divide it so as to show that $\frac{1}{2}$ = 3 times $\frac{1}{6}$.
5. Draw an oblong 8 in. long and 1 in. high, separating it into 1-in. squares. Then $\frac{1}{4}$ = how many eighths? $\frac{1}{2}$ = how many eighths?

**ORAL EXERCISE**

1. Some children in school made these baskets out of raffia. The raffia for the 3 baskets cost 12 ct. What was the average cost of each?

2. If they sold each basket for 10 ct. at a school fair, what was the average gain on each? What was the gain on the three?

3. Of these three baskets the largest holds 1 qt. and the smallest 1 pt. The third holds half as much as the other two together. How much does the third hold?

4. The children made some table mats out of reeds. They paid 6 ct. for enough reeds for a dozen mats. How much did the reeds cost for 2 mats? for 1 mat?

WRITTEN EXERCISE

1. John made 2 small baskets in 3 hr. How many minutes did it take him?

2. At that rate, how long would it take him to make 1 such basket?

ROMAN NUMERALS

ORAL EXERCISE

1. Read these numbers which are found on the clock face :

III, IX, XII, I, VII, IV, XI, V.

2. Tell the time when the minute hand points to XII and the hour hand to IX ; to XI ; to II ; to X ; to XII.

The Roman numerals are also used for numbering the chapters of books.

1 to 5:	I,	II,	III,	IV,	V.
11 to 15:	XI,	XII,	XIII,	XIV,	XV.
6 to 10:	VI,	VII,	VIII,	IX,	X.
16 to 20:	XVI,	XVII,	XVIII,	XIX,	XX.

3. When you come to Chapter XIV in a book, how many chapters have you read?

4. When you have finished Chapter IX of a book, and the last chapter is XV, how many chapters have you still to read?

WRITTEN EXERCISE

1. Write in Roman numerals: 20, 12, 7, 6, 18, 16, 19, 15.

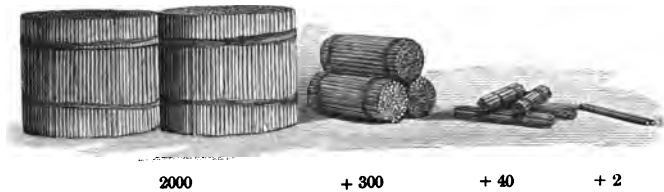
2. Write in common (Arabic) numerals: XI, IX, IV, VI, XIX, XIV, XVII.

3. Write your age in Roman numerals.

CHAPTER III

I. NUMBERS TO 10,000

READING AND WRITING NUMBERS



ORAL EXERCISE

1. Count by 1000's from 1000 to 10,000.
2. How many splints are there in the picture?
Write the number on the blackboard.
3. Read the numbers:

27	270	2700	271	2710	2713
35	350	3500	356	3560	3567

WRITTEN EXERCISE

1. Write the numbers:
Two thousand three hundred forty-five
Seven thousand eight hundred ninety
Six thousand seven hundred eighty-nine
2. Write in words: 2143, 9009, 9876.

ORAL EXERCISE

Read aloud:

1. Columbus discovered America in 1492. George Washington was born in 1732. Henry Hudson discovered the Hudson River in 1609. The Pilgrims landed at Plymouth in 1620. Boston was founded in 1630. The first American newspaper was printed in Boston in 1704.

2. The Declaration of Independence was signed in 1776. George Washington became President in 1789. The first passenger railroad in America was begun in 1828. The great Chicago fire was in 1871. Our war with Spain began in 1898.

You have learned to write the Roman numerals to XX, twenty. Although not much used for larger numbers, they are easily written.

From 21 to 30: XXI, XXII, XXIII, XXIV, XXV, XXVI, XXVII, XXVIII, XXIX, XXX.

From 31 to 40: XXXI, XXXII, and so on to XXXIX, XL.

From 41 to 50: XLI, XLII, and so on to XLIX, L.

From 51 to 60: LI, LII, and so on to LIX, LX.

60 = LX, 70 = LXX, 80 = LXXX, 90 = XC.

From 91 to 100: XCI, XCII, XCIII, XCIV, and so on to XCIX, C.

WRITTEN EXERCISE

1. Write in Roman: 4, 42, 73, 75, 79, 84, 89.

2. Write in Arabic: XXXIX, XLIV, LXXIX, LXXXVIII.

MEASURES

ORAL EXERCISE

1. These children are playing store. Jack buys



20 ct. worth of candy and gives a quarter of a dollar. How much change is due?

2. Fanny buys 10 ct. worth of bananas at 2 for a nickel. How many bananas does she buy?

3. The dealer says that oranges

are sold at 3 for a dime. How much will half a dozen oranges cost?

We write \$12.50 for 12 dollars and 50 cents,
 \$175.05 for 175 dollars and 5 cents.

That is, write first the dollar sign (\$), then the number of dollars, then a period (decimal point), then the number of dimes, and then the number of cents.

WRITTEN EXERCISE

Write in figures, as above: 1 dollar and 5 cents,
7 dollars and 16 cents, 925 dollars and 25 cents,
17 dollars and 50 cents.

**BOYS FROM THE SCHOOL REGIMENT****ORAL EXERCISE**

1. The flag for the school regiment cost \$3.50 and the drum \$4. How much did the two cost?
2. The fife cost \$3. How much did the fife, the drum, and the flag together cost?
3. When Charley bought the flag he handed the dealer \$4. How much change did he receive?
4. There are 16 boys in the regiment besides the officers. Their 16 caps cost half a dollar each. How much did they all cost?

WRITTEN EXERCISE

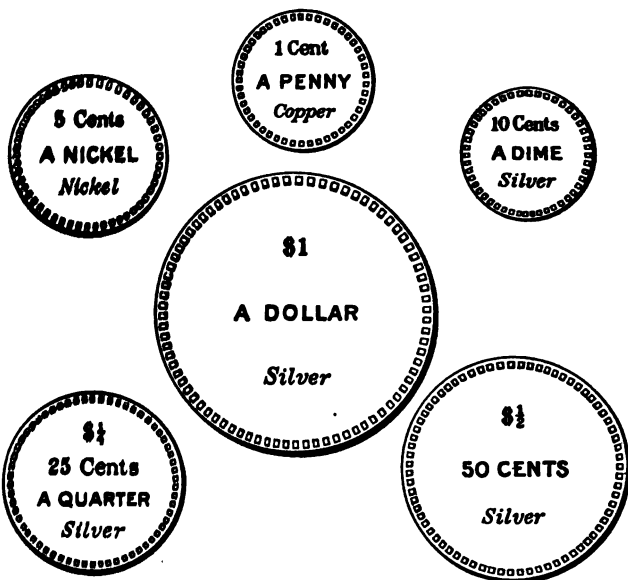
1. If the 16 boys stand 4 in a line, how many lines are there? Make dots on paper showing how the boys are placed.
2. If the 16 boys have 25-ct. belts, how much did the belts cost for the 4 boys in the front row? How much for the 4 rows?

ORAL EXERCISE

1. Suppose you have 11 nickels. Count by 5's and see how many cents you have.

2. How many cents make 7 nickels? 8 dimes?

These circles show the size of the most common coins.



We add dollars and cents like other numbers, writing dollars under dollars, dimes under dimes, and cents under cents.

\$4.76
2.29
\$7.05

WRITTEN EXERCISE

- | | |
|---------------------|---------------------|
| 1. \$1.20 + \$2.00. | 2. \$3.25 + \$4.05. |
| 3. \$6.75 + \$1.25. | 4. \$1.06 + \$5.07. |

ORAL EXERCISE

1. Can you tell how warm it is by looking at the thermometer? Try it. Do you know how warm it is out of doors to-day?

2. Do you know at what temperature water freezes? At what temperature does it boil? What is the temperature of your body?

3. Write the temperature of the room on the blackboard. Subtract 32 degrees from this to see how much it is above freezing.

4. You write 32 dollars like this: \$32. You write 32 feet like this: 32 ft. Can you tell how we usually write 32 degrees?

You have told the teacher, or the teacher has told you, that *water freezes at 32 degrees*, written 32° ; *water boils at 212°* ; *the temperature of the body is about 98°* .

WRITTEN EXERCISE

1. How many degrees from 32° to 212° , from water freezing to water boiling?

2. How many degrees from 32° to 98° , from water freezing to your temperature?

3. If it is 52° in the Eskimo boy's snow hut, and is 68° in your school, how much warmer is it where you are?

4. If it is 18° outdoors where the Eskimo boy lives, and is 65° outdoors to-day where you live, how much warmer is it where you are?



ORAL EXERCISE

1. Which of these three triangles has an obtuse angle? What kind of a triangle is this?



2. Which has a right angle? Point to the right angle. What kind of a triangle is this?

3. In which of the triangles are all of the angles acute? What kind of a triangle is this?

4. Take 3 narrow strips of paper 3 in., 4 in., and 5 in. long. Place them so as to make a triangle. What kind of a triangle is it?

A triangle having a right angle is a *right-angled triangle*.

A triangle having an obtuse angle is an *obtuse-angled triangle*.

A triangle having three acute angles is an *acute-angled triangle*.

WRITTEN EXERCISE

1. How far is it around a triangle whose sides are 14 ft., 12 ft., and 12 ft.?

2. Draw an acute-angled triangle with two of its sides 2 in. and 3 in. Measure the third side and find how far it is around.

3. Draw a right-angled triangle with the shortest side $1\frac{1}{2}$ in., the next longer side 2 in. Measure and find the length of the longest side.

ORAL EXERCISE

1. This picture shows a marble floor made of pieces 1 ft. square. How many square feet are there?

2. How many yards long is it on each side? We may call this what kind of a square?



3. How many square feet are there in 1 square yard? Then 1 sq. ft. is what part of 1 sq. yd.?

As there are square inches and square feet, so there are square yards, square rods, and square miles. You have just found that

$$9 \text{ square feet} = 1 \text{ square yard (sq. yd.)}.$$

WRITTEN EXERCISE

1. Draw a square 4 in. on a side. Show how many square inches it contains.

2. Draw a picture of a square 2 ft. on a side, using $\frac{1}{2}$ in. for a foot. How many square feet in the square?

This is called drawing *to a scale* of $\frac{1}{2}$ in. to 1 ft.

3. Draw a picture of an oblong 2 yd. wide and 3 yd. long, on a scale of 1 in. to the yard. How many square yards in the oblong?

4. It is 12 in. around a square. What is the length of each side? How many square inches does the square contain?

ORAL EXERCISE

1. If each of these blocks is 1 ft. square, how many square feet in the lower row?



2. How many rows are there? How many square feet are there in all?

You have found that the lower row contains 3 times 1 sq. ft. Therefore, in 4 rows there are 4 times 3 sq. ft., or 12 sq. ft.

In finding areas, we write either

4 times 3 times 1 sq. ft. = 12 sq. ft.
or 4 times 3 sq. ft. = 12 sq. ft.,
using \times to express the multiplication.

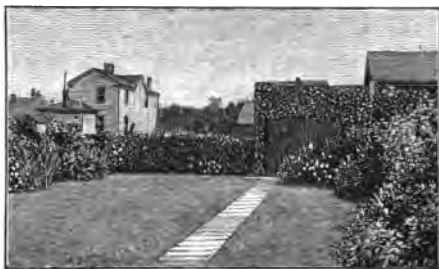
WRITTEN EXERCISE

A man in Dayton, Ohio, set to work with his boys to make their yard into a little park.

1. It was 30 yd. long and 9 yd. wide. What was the area?

2. The walk was 3 ft. wide

and it ran the length of the lot. How many square feet of walk?



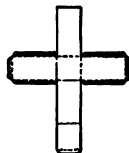
3. He used 70 sq. yd. for shrubbery. You have found the area of the lot and of the walk. How many square yards were left for lawn?

PAPER FOLDING

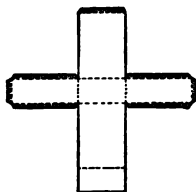
1. Draw this figure 8 times as large. Cut it out and fold the paper along the dotted lines. Make a cube by pasting the shaded strips.



2. Draw this figure 8 times as large. Cut it out and fold the paper along the dotted lines. Make a prism by pasting the shaded strips. Can you see how many cubic inches this prism contains?



3. Draw this figure 8 times as large. Cut it out and fold the paper as before, making a prism. This prism is how many times as large as the other one? How many cubic inches does it contain?



4. You have now learned how to fold cubes and prisms. Draw the plan for a cube that shall be 2 in. on an edge. Fold the cube. How many cubic inches does it contain?

5. Cut and fold the paper to make a cubical box 1 in. on an edge.

6. Cut and fold the paper to make a prism that is 4 in. by 2 in. by 3 in. How many cubic inches does it contain?



Schools that do not have the facilities for paper folding may omit the few exercises in which it is required. For schools that do give such work, these exercises will suggest others.

ORAL EXERCISE

1. How many cubic inches in a block 1 in. long, 1 in. wide, and 1 in. high?

2. How long is the edge of a cubic foot? of a cubic yard?

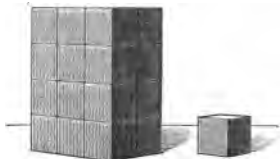


We write cu. in. for cubic inch or cubic inches; cu. ft. for cubic foot or cubic feet.

3. Let us make it 3 times as long. How many cubic inches in a block 3 in. long, 1 in. wide, and 1 in. high?

4. Let us make it twice as wide. How many cubic inches in a block 3 in. long, 2 in. wide, and 1 in. high?

5. Let us make it 4 times as high. How many cubic inches in a block 3 in. long, 2 in. wide, and 4 in. high?



Since a block 1 in. long, 1 in. wide, and 1 in. high contains 1 cu. in., a block 3 times as long contains 3 times 1 cu. in. = 3 cu. in., and a block 2 times as wide contains 2 times 3 cu. in. = 6 cu. in., and a block 4 times as high contains 4 times 6 cu. in. = 24 cu. in.


6. How many cubic inches in a block 2 in. long, 2 in. wide, and 1 in. thick? Suppose it were 3 in. thick?

For this page and the next, teachers should use inch cubes of wood, obtainable from dealers in kindergarten material.

ORAL EXERCISE

1. What is the sum of all the edges of an inch cube?
2. What is the sum of all the edges of a 2-in. cube?
3. What is the area of all the six sides of an inch cube?
4. What is the area of all the six sides of a 2-in. cube?
5. How many cubic inches in a 2-in. cube? in a 3-in. cube?

WRITTEN EXERCISE

1. How many cubic inches in a block 5 in. long, 3 in. high, and 3 in. wide?
2. How many cubic feet in a  ditch 11 ft. long, 2 ft. wide, and 4 ft. deep?
3. How many cubic feet in a cupboard 8 ft. long, 4 ft. wide, and 3 ft. high?
4. How many cubic inches in a lunch box 6 in. long, 5 in. wide, and 3 in. deep? How many square inches on the outside?
5. How many cubic inches in a drawer 8 in. by 4 in., and 3 in. deep? How many square inches on the inside?
6. Measure the inside of a crayon box in inches and find its volume and the area of the inside (including the cover).

FRACTIONS

ORAL EXERCISE

1. If we cut an apple into halves, and each half into halves, we have cut the apple into what parts?



2. We therefore see that $\frac{1}{2}$ of $\frac{1}{2}$ of an apple is what part of an apple?

3. How many fourths are $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$? How do you write this?

The teacher should copy these columns on the board, a pupil writing the sum under each.

3	7	10	25
---	---	----	----

3	7	10	25
---	---	----	----

3	7	10	25
---	---	----	----

3	7	10	25
---	---	----	----

4. At 12 ct. a yard, how much will $\frac{1}{2}$ yd. of cloth cost? $\frac{1}{4}$ yd.?

$\frac{3}{4}$ yd.? (Point to $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{3}{4}$ of the 3 column.)

5. At 28 ct. a yard, how much will $\frac{1}{2}$ yd. cost? $\frac{1}{4}$ yd.? $\frac{3}{4}$ yd.? (Use the 7 column.)

6. At 40 ct. a dozen, how many oranges can be bought for 20 ct.? How much will $\frac{1}{4}$ doz. cost? $\frac{3}{4}$ doz.? (Use the 10 column.)

7. At \$1 a bushel, how much will $\frac{1}{2}$ bu. of apples cost? $\frac{1}{4}$ bu.? $\frac{3}{4}$ bu.? How many pecks can you buy for 75 ct.? (Use the 25 column.)

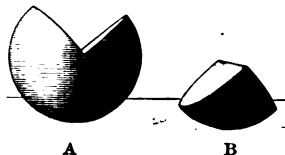
WRITTEN EXERCISE

1. Write in figures: three fourths, two thirds.

2. How much is $\frac{1}{2}$ of 24? $\frac{1}{4}$ of 24? $\frac{1}{2}$ of 40? $\frac{1}{4}$ of 60?

ORAL EXERCISE

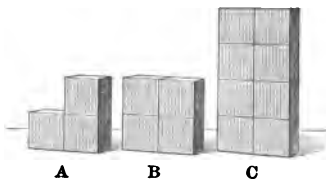
1. What part of the sphere is B? Then how many fourths of a sphere is A? How do you write the fraction?



2. If you call the sphere 1, what is A? B? If you represent B by 1, what is A? If you represent A by 1, what is B?

3. If the sphere weighs 8 oz., how much does B weigh? A?

4. If in these groups of cubes you represent C by 1, what is B? If B is 1, what is A? If A is 1, what is B?



5. Looking at B and A, $1 - \frac{1}{4} =$ how many fourths? $1 - \frac{3}{4} =$ how much?

6. Point to $\frac{1}{4}$ of C; to $\frac{1}{2}$ of C. Show that $\frac{1}{2}$ of C = $\frac{2}{4}$ of C.



7. How many thirds are $\frac{1}{3} + \frac{1}{3}$? Show this by the picture.

8. How much is $1 - \frac{1}{3}$? $1 - \frac{2}{3}$? Show this by the picture.



9. How much is $\frac{1}{5} + \frac{1}{5}$? $\frac{1}{5} + \frac{2}{5}$? $\frac{2}{5} + \frac{2}{5}$? Show this by the picture.

10. How much is 1 in. - $\frac{2}{5}$ in.? 1 in. - $\frac{4}{5}$ in.? $\frac{4}{5}$ in. - $\frac{1}{5}$ in.? Show this by the picture.

ADDITION

In adding long columns, write the sum of each column separately. You can then check the work more easily.

Business men usually add *up* the first time, and check the result by adding *down*.

Remember to read a column like a word. You do not spell a word; you read it by syllables if it is long.

So when you see this column your eyes should catch the two 10's at once and you should see that the sum is two 10's and 6, or 26.

Add rapidly; you will make fewer mistakes. Group by 10's or other numbers.

$$\begin{array}{r}
 75 \\
 88 \\
 67 \\
 96 \\
 54 \\
 \hline
 43 \\
 33 \text{ sum of units} \\
 39 \text{ " " tens} \\
 \hline
 423 \text{ total sum}
 \end{array}$$

$$\begin{array}{r}
 6 \\
 3 \quad \diagup \quad \diagdown \quad 10 \\
 7 \quad \diagup \quad \diagdown \quad 10 \\
 2 \\
 5 \quad \diagup \quad \diagdown \quad 10 \\
 3 \quad \diagup \quad \diagdown \quad 10 \\
 \hline
 26
 \end{array}$$

WRITTEN EXERCISE

- | | | | | |
|------------|------------|------------|-------------|-------------|
| 1. 49 | 2. 78 | 3. 128 | 4. 641 | 5. 302 |
| 87 | 32 | 62 | 127 | 87 |
| 31 | 53 | 27 | 143 | 21 |
| 53 | 46 | 48 | 59 | 63 |
| <u>64</u> | <u>11</u> | <u>263</u> | <u>42</u> | <u>97</u> |
| 6. 3152 | 7. 4172 | 8. 1247 | 9. \$2.76 | 10. \$1.42 |
| 2237 | 1296 | 263 | 2.94 | 3.76 |
| <u>468</u> | <u>327</u> | <u>602</u> | <u>3.15</u> | <u>4.93</u> |

SUBTRACTION

ORAL EXERCISE

Subtract rapidly, stating first the units, then the tens, and so on, finally stating the answer. Do not repeat the numbers; simply tell the results.

- | | | | | |
|--|--|--|--|---|
| 1. $\begin{array}{r} 74 \\ 43 \\ \hline \end{array}$ | 2. $\begin{array}{r} 96 \\ 75 \\ \hline \end{array}$ | 3. $\begin{array}{r} \$8.65 \\ 6.40 \\ \hline \end{array}$ | 4. $\begin{array}{r} 92 \\ 70 \\ \hline \end{array}$ | 5. $\begin{array}{r} 57 \\ 42 \\ \hline \end{array}$ |
| 6. $\begin{array}{r} 45 \\ 24 \\ \hline \end{array}$ | 7. $\begin{array}{r} 98 \\ 24 \\ \hline \end{array}$ | 8. $\begin{array}{r} 5800 \\ 1600 \\ \hline \end{array}$ | 9. $\begin{array}{r} 79 \\ 54 \\ \hline \end{array}$ | 10. $\begin{array}{r} 62 \\ 41 \\ \hline \end{array}$ |

The above numbers and the following explanation should be written on the board. No explanations of the decimal point are needed here. Children should add and subtract in money problems as with integers.

As with 3-figure numbers (see page 85),

This shows all the work: *But we write only this:*

$1632 = 1500 + 120 + 12$	1632
$756 = 700 + 50 + 6$	756
$\quad \quad \quad \underline{800 + 70 + 6} = 876$	$\quad \quad \quad \underline{876}$

Remember that *to check the work, you add the subtrahend and remainder; the sum should equal the minuend.*

WRITTEN EXERCISE

Subtract:

- | | | | | |
|--|--|--|--|--|
| 1. $\begin{array}{r} 8659 \\ 4231 \\ \hline \end{array}$ | 2. $\begin{array}{r} 8651 \\ 4239 \\ \hline \end{array}$ | 3. $\begin{array}{r} 8651 \\ 4479 \\ \hline \end{array}$ | 4. $\begin{array}{r} \$86.51 \\ 48.79 \\ \hline \end{array}$ | 5. $\begin{array}{r} \$80.00 \\ 48.79 \\ \hline \end{array}$ |
| 6. $\begin{array}{r} 6535 \\ 4176 \\ \hline \end{array}$ | 7. $\begin{array}{r} 2800 \\ 177 \\ \hline \end{array}$ | 8. $\begin{array}{r} 4327 \\ 1009 \\ \hline \end{array}$ | 9. $\begin{array}{r} \$90.21 \\ 7.53 \\ \hline \end{array}$ | 10. $\begin{array}{r} \$50.27 \\ 6.35 \\ \hline \end{array}$ |

WRITTEN EXERCISE

1. $487 + 1263 + 1079$. 2. $728 + 2693 + 1982$.
3. $1028 + 2347 + 3687$. 4. $2983 + 1789 + 2864$.
5. $2009 + 1874 + 2096$. 6. $4027 + 1089 + 1987$.
7. $1423 + 1346 + 4892$. 8. $3276 + 2483 + 1872$.
9. $3248 + 3821 + 1924$. 10. $2708 + 2873 + 1296$.
11. There are 5280 ft. in a mile, and 2640 in a half mile; how many feet in $1\frac{1}{2}$ mi.?
12. A man started in business with \$5500. He saved \$750 the first year and \$875 the second. How much did he have in all at the end of the second year?

Make problems for Exs. 13-16, and find the answers:

13. 5280 ft.	14. \$2575	15. \$1575	16. \$4500
2640	575	1275	625
<u>1320</u>	<u>1425</u>	<u>2010</u>	<u>795</u>

17. $6723 - 594$. 18. $6201 - 732$. 19. $7826 - 948$.
20. $\$650 + \75 . 21. $\$429 + \86 . 22. $\$347 + \95 .
23. $\$826 - \78 . 24. $\$432 - \69 . 25. $\$321 - \46 .
26. $4826 - 2938$. 27. $8072 - 6993$. 28. $3468 - 1896$.
29. $2987 - 1799$. 30. $5707 - 4902$. 31. $2093 - 1735$.
32. $3702 - 2075$. 33. $6270 - 5295$. 34. $3742 - 2981$.
35. $4805 - 2967$. 36. $4083 - 3078$. 37. $2681 - 1692$.
38. $5120 - 1635$. 39. $2009 - 1927$. 40. $3942 - 2875$.
41. $6000 - 1750$. 42. $1700 - 1296$. 43. $4073 - 1492$.
44. $7001 - 1992$. 45. $8111 - 7888$. 46. $8101 - 5909$.

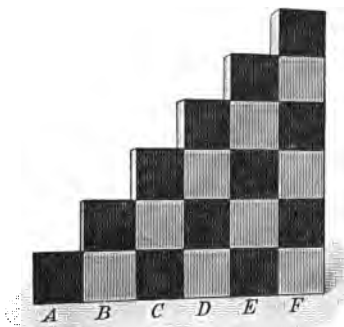
WRITTEN EXERCISE

- | | | |
|-------------------------------|---------------------------|---------------------------|
| 1. $\frac{1}{2}$ of 68. | 2. $\frac{1}{2}$ of 86. | 3. $\frac{1}{2}$ of 64. |
| 4. $\frac{1}{3}$ of 66. | 5. $\frac{1}{3}$ of 39. | 6. $\frac{1}{3}$ of 63. |
| 7. $\frac{1}{4}$ of 48. | 8. $\frac{1}{4}$ of 80. | 9. $\frac{1}{4}$ of 84. |
| 10. $\frac{1}{5}$ of 55. | 11. $\frac{1}{5}$ of 500. | 12. $\frac{1}{5}$ of 550. |
| 13. $488 \div 4$. | 14. $248 \div 2$. | 15. $866 \div 2$. |
| 16. $804 \div 4$. | 17. $606 \div 2$. | 18. $606 \div 3$. |
| 19. 3 times 66. | 20. 4 times 48. | 21. 5 times 77. |
| 22. $2802 - 1763$. | 23. $6023 - 4927$. | |
| 24. $1489 - 1093$. | 25. $4807 - 3096$. | |
| 26. $2986 - 1897$. | 27. $6096 - 2599$. | |
| 28. $2084 - 1975$. | 29. $4923 - 2876$. | |
| 30. $8426 - 2498$. | 31. $6800 - 4975$. | |
| 32. $8090 - 7099$. | 33. $7027 - 2975$. | |
| 34. $6203 - 3496$. | 35. $9800 - 2899$. | |
| 36. $\$4027 - \967 . | 37. $\$8900 - \987 . | |
| 38. $\$4.67 + \3.84 . | 39. $\$2.95 + \4.68 . | |
| 40. $\$2.96 + \1.98 . | 41. $\$1.78 + \4.96 . | |
| 42. $\$3.48 + \2.63 . | 43. $\$2.69 + \3.48 . | |
| 44. $275 + 68 + 8000 + 873$. | | |
| 45. $123 + 98 + 2075 + 673$. | | |
| 46. $342 + 87 + 1273 + 929$. | | |
| 47. $298 + 75 + 3026 + 873$. | | |
| 48. $375 + 42 + 2083 + 176$. | | |
| 49. $186 + 37 + 1029 + 199$. | | |
| 50. $187 + 92 + 2040 + 796$. | | |
| 51. $892 + 28 + 4872 + 635$. | | |
| 52. $176 + 39 + 2893 + 742$. | | |

COUNTING BY DIFFERENT NUMBERS

ORAL EXERCISE

1. How many cubes in each column?
2. If each cube weighs 6 oz., what is the weight of A? of B? of C? of D? of E? of F?



3. Which column shows $\frac{1}{6}$ of 6 blocks? $\frac{1}{3}$ of 6? $\frac{1}{2}$ of 6? $\frac{2}{3}$ of 6? $\frac{5}{6}$ of 6? What does each equal?

4. How many sides has a cube? How many sides have both cubes of B? all 3 cubes of C? Count rapidly the sides of all the cubes in the columns from A to F.

The teacher should write on the board columns of 6's up as far as ten 6's, the pupils adding each column. Here are five such columns.

5. From the columns on the board you see that 6 is $\frac{1}{2}$ of what number? $\frac{1}{3}$ of what number? $\frac{1}{4}$ of what number? $\frac{1}{5}$ of what number?

6. You also see that 12 is $\frac{1}{2}$ of what number? $\frac{2}{3}$ of what number? Also that 18 is $\frac{3}{4}$ of what number? $1\frac{1}{2}$ times what number? Tell two other number facts about these columns.

ORAL EXERCISE

1. Count by 6's from 0 to 60, thus :

0	6	12	18	24
30	36	42	48	etc.

Count again, saying, "One 6 is 6, two 6's are 12, three 6's are 18," and so on.

2. Count in this way: "In 6 there is one 6, in 12 there are two 6's," and so on to 60.

3. State rapidly the value of each of the following:

1×6	6×1	6×6	6×6
2×6	6×2	7×6	6×7
3×6	6×3	8×6	6×8
4×6	6×4	9×6	6×9
5×6	6×5	10×6	6×10

4. State rapidly the value of each of the following:

$6 \div 6$	$6 \div 1$	$36 \div 6$	$36 \div 6$
$12 \div 6$	$12 \div 2$	$42 \div 6$	$42 \div 7$
$18 \div 6$	$18 \div 3$	$48 \div 6$	$48 \div 8$
$24 \div 6$	$24 \div 4$	$54 \div 6$	$54 \div 9$
$30 \div 6$	$30 \div 5$	$60 \div 6$	$60 \div 10$

WRITTEN EXERCISE

1. Copy Exs. 3 and 4 above, and write the answers.
2. Multiply by 6: 40, 41, 51, 70, 81.
3. Divide by 6: \$36, 42 ft., 54 ct., 48 yd.

WRITTEN EXERCISE

Add the products in Exs. 1-24:

- | | |
|-------------------------------------|-------------------------------------|
| 1. 5×6 and 2×3 . | 2. 4×2 and 3×4 . |
| 3. 2×5 and 4×3 . | 4. 3×3 and 4×4 . |
| 5. 5×2 and 2×6 . | 6. 3×4 and 5×4 . |
| 7. 3×5 and 5×3 . | 8. 2×6 and 3×6 . |
| 9. 4×2 and 4×3 . | 10. 3×5 and 4×6 . |
| 11. 6×4 and 4×5 . | 12. 6×7 and 6×2 . |
| 13. 2×3 and 3×6 . | 14. 3×3 and 4×5 . |
| 15. 9×2 and 8×2 . | 16. 8×3 and 7×4 . |
| 17. 7×3 and 5×3 . | 18. 6×2 and 9×3 . |
| 19. 4×6 and 9×6 . | 20. 8×2 and 7×2 . |
| 21. 9×1 and 8×5 . | 22. 7×3 and 8×2 . |
| 23. 6×4 and 9×4 . | 24. 8×5 and 9×5 . |

25. At 5 ct. each for oranges and 3 ct. each for bananas, what will 7 oranges and 6 bananas cost?

26. In this recess game Chester's first score was

four 6's and two 3's. How much was this score?

27. His third score was three 6's and three 3's. How much was this score?



numbers being changed from time to time. Such games should, however, not take time from the rapid drill work.

ORAL EXERCISE

1. Count by 7's from 0 to 70. Count again, saying, "One 7 is 7, two 7's are 14," and so on.

2. Count in this way: "In 7 there is one 7, in 14 there are two 7's," and so on to 70.

3. State rapidly the value of each of the following:

1×7	7×1	6×7	7×6
2×7	7×2	7×7	7×7
3×7	7×3	8×7	7×8
4×7	7×4	9×7	7×9
5×7	7×5	10×7	7×10

4. State rapidly the value of each of the following:

$7 \div 7$	$7 \div 1$	$42 \div 7$	$42 \div 6$
$14 \div 7$	$14 \div 2$	$49 \div 7$	$49 \div 7$
$21 \div 7$	$21 \div 3$	$56 \div 7$	$56 \div 8$
$28 \div 7$	$28 \div 4$	$63 \div 7$	$63 \div 9$
$35 \div 7$	$35 \div 5$	$70 \div 7$	$70 \div 10$

WRITTEN EXERCISE

1. Copy Exs. 3 and 4 above, and write the answers.

2. Multiply by 7: 30, 61, 43, 25, 24, 35, 92, 67, 49.

3. Divide by 7: 63, 42, \$56, 28 ft., 49 in., 70 yd.

4. If 35 children are playing a game, and $\frac{1}{7}$ of them are hiding, how many are not hiding?

ORAL EXERCISE

1. A class has been weaving mats like this. How many horizontal strips? How many vertical ones? How many in all?



2. You see 8 meshes on each line. How many are there on 2 lines? on 3? on 4? on 5?

3. Walk rapidly, counting 8 for each step until you reach 80. How many steps did you take?

4. State rapidly the value of each of the following:

1×8	8×1	6×8	8×6
2×8	8×2	7×8	8×7
3×8	8×3	8×8	8×8
4×8	8×4	9×8	8×9
5×8	8×5	10×8	8×10

5. State rapidly the value of each of the following:

$8 \div 8$	$8 \div 1$	$48 \div 8$	$48 \div 6$
$16 \div 8$	$16 \div 2$	$56 \div 8$	$56 \div 7$
$24 \div 8$	$24 \div 3$	$64 \div 8$	$64 \div 8$
$32 \div 8$	$32 \div 4$	$72 \div 8$	$72 \div 9$
$40 \div 8$	$40 \div 5$	$80 \div 8$	$80 \div 10$

6. Tell the numbers from 9 to 18, each increased by 8; each decreased by 8.

WRITTEN EXERCISE

Copy Exs. 4 and 5 and write the answers.

ORAL EXERCISE

1. Count by 9's from 0 to 90. Count again, saying, "One 9 is 9, two 9's are 18," and so on.

2. Count in this way: "In 9 there is one 9, in 18 there are two 9's," and so on to 90.

3. State rapidly the value of each of the following:

1×9	9×1	6×9	9×6
2×9	9×2	7×9	9×7
3×9	9×3	8×9	9×8
4×9	9×4	9×9	9×9
5×9	9×5	10×9	9×10

4. State rapidly the value of each of the following:

$9 \div 9$	$9 \div 1$	$54 \div 9$	$54 \div 6$
$18 \div 9$	$18 \div 2$	$63 \div 9$	$63 \div 7$
$27 \div 9$	$27 \div 3$	$72 \div 9$	$72 \div 8$
$36 \div 9$	$36 \div 4$	$81 \div 9$	$81 \div 9$
$45 \div 9$	$45 \div 5$	$90 \div 9$	$90 \div 10$

WRITTEN EXERCISE

1. Copy Exs. 3 and 4 above and write the answers.

2. Multiply by 9: 30, 37, 67, 27, 46, 49.

3. Divide by 9: \$81, 90 ft., 63 in., 54 bu.

4. How many yards of ribbon at 9 ct. a yard can be bought for 45 ct.?

ORAL EXERCISE

1. Count by 10's from 0 to 100, as you have counted by other numbers.

2. Give the tables of 10's, as you have of other numbers.

3. How much is 10 times 7? 10 times 55? 10 times 600? 10 times 725? What short way have you found for multiplying by 10?

4. How much will 10 oranges cost at 5 ct. apiece? at 6 ct. apiece? at 4 ct. apiece?

5. How much will 10 yd. of cloth cost at 9 ct. a yard? at 3 ct. a yard? at 12 ct. a yard?

6. There are 100 years in a century. How many years are there in 10 centuries? in 20 centuries?

7. How many school days in 2 weeks? If you are in school 5 hours a day, how many hours will you spend in school in 2 weeks? in 4 weeks?

8. If in 4 weeks you spend 100 hours in school, how many hours will you spend in 40 weeks, or 10 times 4 weeks?

WRITTEN EXERCISE

Write the tables of 10's, as you did the tables of 9's.

Besides frequent drill in counting by different numbers beginning with 0, pupils should learn to count by 4's, beginning with 1, 2, or 3, and by 5's, beginning with 1, 2, 3, or 4.

REVIEW OF THE MULTIPLICATION TABLE

You have now learned how to multiply together any two numbers of one figure each.

Since $2 \times 1 = 1 \times 2$, we need give only one of these products.

$1 \times 1 = 1$									
$2 \times 1 = 2$	$2 \times 2 = 4$								
$3 \times 1 = 3$	$3 \times 2 = 6$	$3 \times 3 = 9$							
$4 \times 1 = 4$	$4 \times 2 = 8$	$4 \times 3 = 12$	$4 \times 4 = 16$						
$5 \times 1 = 5$	$5 \times 2 = 10$	$5 \times 3 = 15$	$5 \times 4 = 20$	$5 \times 5 = 25$					
$6 \times 1 = 6$	$6 \times 2 = 12$	$6 \times 3 = 18$	$6 \times 4 = 24$	$6 \times 5 = 30$					
$6 \times 6 = 36$									
$7 \times 1 = 7$	$7 \times 2 = 14$	$7 \times 3 = 21$	$7 \times 4 = 28$	$7 \times 5 = 35$					
$7 \times 6 = 42$	$7 \times 7 = 49$								
$8 \times 1 = 8$	$8 \times 2 = 16$	$8 \times 3 = 24$	$8 \times 4 = 32$	$8 \times 5 = 40$					
$8 \times 6 = 48$	$8 \times 7 = 56$	$8 \times 8 = 64$							
$9 \times 1 = 9$	$9 \times 2 = 18$	$9 \times 3 = 27$	$9 \times 4 = 36$	$9 \times 5 = 45$					
$9 \times 6 = 54$	$9 \times 7 = 63$	$9 \times 8 = 72$	$9 \times 9 = 81$						

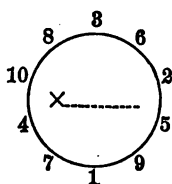
In the following table the product of any left-hand number and top number is opposite the first and under the second.

	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Counting by 1's
 " " 2's
 " " 3's
 " " 4's
 " " 5's
 " " 6's
 " " 7's
 " " 8's
 " " 9's
 " " 10's

ORAL EXERCISE

1. State the multiplication table of 2's; of 3's; of 4's; of 5's.
2. State the multiplication table of 6's; of 7's; of 8's; of 9's.
3. I am thinking of two numbers whose product is 18. What may the numbers be?
4. I am thinking of two numbers whose product is 30. What may the numbers be?
5. I am thinking of two numbers of one figure each whose product is 20. What are the numbers?
6. You know that 2 times 11 are 22, and 3 times 11 are 33. It is therefore very easy to count by 11's. Give the multiplication table of 11's.



This figure may be drawn on the black-board and made the basis of interesting exercises. Write some number in the center and let the children tell the products as one of the class points to the outer numbers. Instead of products, the children may tell the products increased by some number, as 2 or 3.

WRITTEN EXERCISE

1. Write the multiplication table of 11's mentioned in Ex. 6, above.
2. Write the 2's from 2 to 20, and under them write the 12's 2, 4, 6, 8, and so on to 20. from 12 to 120. 12, 24, 36, 48, and so on to 120.
3. Write the multiplication table of 12's with the help of Ex. 2.

MULTIPLICATION

ORAL EXERCISE

Multiply, stating first the units, then the tens, and so on. Do not repeat the numbers multiplied.

- | | | | | |
|--|--|--|--|---|
| 1. $\begin{array}{r} 11 \\ 7 \end{array}$ | 2. $\begin{array}{r} 21 \\ 5 \end{array}$ | 3. $\begin{array}{r} 40 \\ 6 \end{array}$ | 4. $\begin{array}{r} 70 \\ 8 \end{array}$ | 5. $\begin{array}{r} 90 \\ 9 \end{array}$ |
| 6. $\begin{array}{r} 111 \\ 7 \end{array}$ | 7. $\begin{array}{r} 305 \\ 6 \end{array}$ | 8. $\begin{array}{r} 407 \\ 8 \end{array}$ | 9. $\begin{array}{r} 509 \\ 9 \end{array}$ | 10. $\begin{array}{r} 612 \\ 5 \end{array}$ |

The above examples should be written on the blackboard.

As with smaller numbers (page 87), so in multiplying 438 by 6, we might multiply the units, tens, and hundreds separately and add the products. But this would make the work too long. We therefore say: "6 times 8 are 48 (writing 8); 6 times 3 (tens) are 18 (tens), and $18 + 4 = 22$ (writing 2); 6 times 4 (hundreds) are 24 (hundreds) and $24 + 2 = 26$."

$$\begin{array}{r}
 438 \\
 \underline{6} \\
 48 = 6 \text{ times } 8 \\
 180 = 6 \text{ " } 30 \\
 2400 = 6 \text{ " } 400 \\
 \underline{2628} = 6 \text{ " } 438
 \end{array}$$

Write only this:

$$\begin{array}{r}
 438 \\
 \underline{6} \\
 2628
 \end{array}$$

All such explanations must be developed at the blackboard, but children should not be asked to repeat them.

WRITTEN EXERCISE

Multiply:

- | | | |
|---------------|---------------|---------------|
| 1. 63 by 5. | 2. 72 by 6. | 3. 87 by 7. |
| 4. 96 by 6. | 5. 98 by 7. | 6. 88 by 8. |
| 7. 85 by 9. | 8. 63 by 7. | 9. 126 by 5. |
| 10. 287 by 6. | 11. 407 by 7. | 12. 827 by 8. |

ORAL EXERCISE

1. The land of this farm is worth \$70 an acre. In one of the pastures there are 9 acres. How much is this pasture worth?



2. There is another pasture of 8 acres. How much is that one worth? How much would a 6-acre pasture be worth?

3. There are 20 cows kept on the farm, and each gives an average of 5 qt. of milk a day through the year. This averages how many quarts a day for the farm?

4. At wholesale this milk brings 2 ct. a quart. How much is the average daily income from the milk? How much does this amount to in a week?

WRITTEN EXERCISE

1. If the farmer makes butter instead of selling the milk, it will take the cream of 3 gal. to make 1 lb. of butter. How many pounds could be made daily from 24 gal.?

2. If he sells this butter for 23 ct. a pound, how much will be his daily income from butter?

DIVISION

ORAL EXERCISE

- | | | |
|--------------------------------------|---------------------------------------|---------------------|
| 1. $50 \div 5$. | 2. $55 \div 5$. | 3. $555 \div 5$. |
| 4. $56 \div 7$. | 5. $560 \div 7$. | 6. $560 \div 8$. |
| 7. $63 \div 9$. | 8. $630 \div 9$. | 9. $639 \div 9$. |
| 10. $72 \div 8$. | 11. $720 \div 8$. | 12. $7200 \div 8$. |
| 13. $81 \div 9$. | 14. $810 \div 9$. | 15. $8100 \div 9$. |
| 16. $7 \overline{)4900 + 140 + 7}$. | 17. $8 \overline{)2400 + 160 + 16}$. | |

As with smaller numbers (see page 90), you may think of the number to be divided as separated into parts. Thus, to divide 522 by 6, you may think:

"I do not know the quotient of $500 \div 6$, nor $6 \overline{)522}$
of $520 \div 6$, but because $48 \div 6 = 8$ I know $\frac{87}{87}$
that $480 \div 6 = 80$, leaving 42 to be divided; I know
that $42 \div 6 = 7$. Therefore, the quotient is 87."

Teachers will find it helpful to use either the long-division or the annexed form in developing this process, changing to the short-division form as soon as the children have discovered the reasons for the steps. Formal explanations should not be required at this time.

$$\begin{array}{r} 6 \overline{)480 + 42} \\ 80 + 7 \\ = 87 \end{array}$$

WRITTEN EXERCISE

- | | | |
|---------------------|---------------------|---------------------|
| 1. $275 \div 5$. | 2. $375 \div 5$. | 3. $685 \div 5$. |
| 4. $486 \div 6$. | 5. $552 \div 6$. | 6. $744 \div 6$. |
| 7. $924 \div 7$. | 8. $833 \div 7$. | 9. $854 \div 7$. |
| 10. $816 \div 8$. | 11. $744 \div 8$. | 12. $632 \div 8$. |
| 13. $3330 \div 9$. | 14. $4230 \div 9$. | 15. $8919 \div 9$. |
| 16. $4278 \div 3$. | 17. $2048 \div 8$. | 18. $5735 \div 5$. |

The divisions thus far have been exact; that is, $8 \div 2 = 4$ exactly. But if we try to divide 9 by 2, we have $9 \div 2 = 4$, and one left over. IIII IIII I

The part left over in division is called the *remainder*.

In dividing by 7 we see that 7 is contained in 14 twice; in 17, twice and 3 over; in 16, twice and 2 over; in 27, three times and 6 over.

ORAL EXERCISE

Divide the numbers in the columns by the divisor given, in Exs. 1-6:

1. $45 \div 5$

26

30

27

2. $37 \div 6$

41

23

34

3. $50 \div 7$

35

48

63

4. $64 \div 8$

32

44

51

5. $82 \div 9$

72

62

52

6. $72 \div 10$

30

45

27

When there is a remainder a fraction is written in the quotient, thus: $45 \div 4 = 11$, with 1 still to be divided; and $1 \div 4 = \frac{1}{4}$. Therefore, $45 \div 4 = 11\frac{1}{4}$.

$$\begin{array}{r} 4 \overline{)87} \\ 21\frac{3}{4} \end{array}$$

$$\begin{array}{r} 3 \overline{)92} \\ 30\frac{2}{3} \end{array}$$

$$\begin{array}{r} 8 \overline{)68} \\ 8\frac{4}{8} \text{ or } 8\frac{1}{2} \end{array}$$

State the quotient, including the fraction:

7. $43 \div 4$.

8. $41 \div 2$.

9. $31 \div 3$.

10. $36 \div 5$.

11. $56 \div 5$.

12. $81 \div 4$.

13. $83 \div 4$.

14. $22 \div 4$.

15. $23 \div 2$.

ORAL EXERCISE

State rapidly the results in Exs. 1-8:

- | | |
|---|---------------------------------|
| 1. $56 \div 8$, $56 \div 7$, 7×8 . | 2. $81 \div 9$, 9×9 . |
| 3. $42 \div 6$, $42 \div 7$, 7×6 . | 4. $64 \div 8$, 8×8 . |
| 5. $54 \div 9$, $54 \div 6$, 9×6 . | 6. $49 \div 7$, 7×7 . |
| 7. $48 \div 8$, $48 \div 6$, 6×8 . | 8. $36 \div 6$, 6×6 . |

9. How does the dividend compare with the product of the divisor and the quotient?

10. If the product of the divisor and the quotient equals the dividend, what does this tell about your work?

From Exs. 9 and 10, you have found that, *if the work is correct, the product of the quotient and divisor equals the dividend.*

When we divide 75 by 9 we $9 \overline{)75}$
say that the quotient is 8 and the 8, 3 remainder.
remainder is 3. That is, $72 \div 9 = 8$. Therefore,

If there is a remainder, subtract this from the dividend before checking your work.

WRITTEN EXERCISE

In these examples, check the work by multiplying the quotient by the divisor:

- | | | |
|--------------------|--------------------|--------------------|
| 1. $4866 \div 6$. | 2. $5754 \div 7$. | 3. $6976 \div 8$. |
| 4. $9009 \div 7$. | 5. $1233 \div 9$. | 6. $7005 \div 5$. |

7. If 9 carriages cost \$1125, what does each cost?

8. If there are 224 pupils in 8 classes, how many are there on an average in each class?

ORAL EXERCISE

Sailors are not afraid to approach our shores at night, because the lighthouses warn them of danger and direct them to harbors of safety. The government has built these lighthouses along the coasts. A fog horn is blown when there is a fog.



1. Have you ever seen a lighthouse? If so, tell the class about it. About how high was it?

2. The government has 1332 lighthouses, and 45 light-ships near dangerous shoals. How many of both?

3. On dangerous reefs there are buoys that whistle or ring a bell. We have 90 whistling buoys and 130 bell buoys. How many of both?

WRITTEN EXERCISE

1. Some lights are made to flash every 4 seconds, being bright 2 sec. and then dark 2 sec. How many times does such a light flash in 1 min.?

2. How many times does this light flash in 1 hr.? How many times from 6 P.M. to 6 A.M.?

3. A powerful light burns 2 gal. of oil a night. How many does it burn in a year of 365 days?

4. At 20 ct. a gallon, how much does the oil cost for one night? for one week? for four weeks?

WRITTEN EXERCISE

Florida and California are the great orange-growing states of our country. This is a picture of one of the California groves.

1. This is what it cost a man in California to go into orange growing:

10 acres of orange land, \$750; building a small house, \$500; a well, \$25.50; windmill, \$35.75; pump, \$15; water tank, \$50; horse, \$50; 1000 orange trees, \$600; tools and fencing, \$65.25. What was the total cost?



2. He paid out for help, during the 5 years before the trees began to bear, the following sums: \$27.50, \$25.75, \$19.40, \$23.30, and \$21.50. What is the total of these 5 payments?

3. The first year that the trees bore he sold 1500 boxes of oranges at \$1 a box and 1200 at \$2 a box. How much did he receive in all?

4. In one week he paid \$13.45 for cartage, \$16.50 for labor, \$18.50 for boxes, and \$38.75 for express. What was the total amount?

WRITTEN EXERCISE

Add in Exs. 1-6:

1. \$2341.00	2. \$4817.20	3. \$1263.40
1026.25	280.50	487.50
1248.32	175.25	25.00
543.00	1028.30	620.05
<u>268.16</u>	<u>426.40</u>	<u>35.15</u>
4. \$1200.00	5. \$3147.25	6. \$5234.00
47.50	23.30	48.75
620.00	5162.00	162.00
3.75	29.30	2348.05
41.75	4.75	9.25
<u>27.32</u>	<u>125.00</u>	<u>16.42</u>

Subtract in Exs. 7-14:

7. 2487	8. 4893	9. 1798	10. 3492
<u>1693</u>	<u>2987</u>	<u>1699</u>	<u>1976</u>
11. \$83.75	12. \$87.62	13. \$926.35	14. \$962.75
<u>46.57</u>	<u>48.75</u>	<u>887.26</u>	<u>598.36</u>

Multiply in Exs. 15-20:

15. \$426 by 7. 16. \$327 by 9. 17. \$463 by 5.
 18. \$265 by 8. 19. 423 ft. by 6. 20. 628 yd. by 4.
 21. $2864 \div 4$. 22. $3115 \div 5$. 23. $6006 \div 7$.
 24. $9864 \div 8$. 25. $4111 \div 3$. 26. $3575 \div 2$.

Since the change of a single figure in any of the above problems entirely changes the example, a page like this furnishes much opportunity for drill by changing a few numbers.

**II. OPERATIONS REVIEWED. SPECIAL ATTENTION
TO MULTIPLICATION AND DIVISION****COUNTING REVIEWED****ORAL EXERCISE**

1. Count by 2's from 2 to 100; from 1 to 99.
Which takes the longer?
2. Count to 100 by 3's, beginning with 0; with 1;
with 2.
3. Count to 100 by 4's, beginning with 0; with 1;
with 2; with 3.
4. Count to 100 by 5's, beginning with 0; with 1;
with 2; with 3; with 4.
5. In the same way, count by 6's, beginning with
0 or any number less than 6.
6. In the same way, count by 9's, beginning
with 0 or with any number less than 9.
7. Count to 100 by 7's; by 8's; by 11's; by 12's.

WRITTEN EXERCISE

1. Write the 6's of Ex. 5.
2. Write the 9's of Ex. 6.

Exs. 1 and 2 constitute the new matter, the rest being review work.

3. Write the 3's of Ex. 2.
4. Write the 4's of Ex. 3.
5. Write the 5's of Ex. 4.

ORAL EXERCISE

Read the numbers :

1. V, X, L, C.
2. IV, IX, XL, XC.
3. VI, XI, LI, LXI.
4. XIX, XXIX, XLIX.
5. Where have you seen the Roman numerals used? Why are they harder to work with than our common numerals?

You will have but little need for Roman numerals. Sometimes they are used for dates, and this is the only need you will have for large numbers written in this way.

D means 500, and M means 1000.

Then we write

C, CC, CCC, CD, D, DC, DCC, DCCC, CM, M,
for 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000.

Hence we write

CCLXI for 261, CDXIX for 419, DCCCLX for 860,
CMIV for 904, MD for 1500, MCM for 1900.

The Romans more often wrote MDCCCC for 1900, but now it is usually shortened to MCM.

It should be remembered that the pupil will have little use for these numerals except in reading chapter numbers.

WRITTEN EXERCISE

1. Write in Roman : 562, 743, 827, 329, 101.
2. Write in common numerals: CCCXXIII, CDLIX, DCCLXXVII, CDI, DCCCVIII.
3. Write in common numerals the number of this year.

ADDITION

ORAL EXERCISE

Add rapidly in Exs. 1-10:

- | | | | | |
|--|--|--|--|---|
| 1. $\begin{array}{r} 36 \\ 43 \\ \hline \end{array}$ | 2. $\begin{array}{r} 47 \\ 42 \\ \hline \end{array}$ | 3. $\begin{array}{r} 35 \\ 34 \\ \hline \end{array}$ | 4. $\begin{array}{r} 12 \\ 85 \\ \hline \end{array}$ | 5. $\begin{array}{r} 11 \\ 83 \\ \hline \end{array}$ |
| 6. $\begin{array}{r} 48 \\ 61 \\ \hline \end{array}$ | 7. $\begin{array}{r} 52 \\ 53 \\ \hline \end{array}$ | 8. $\begin{array}{r} 74 \\ 43 \\ \hline \end{array}$ | 9. $\begin{array}{r} 82 \\ 74 \\ \hline \end{array}$ | 10. $\begin{array}{r} 59 \\ 60 \\ \hline \end{array}$ |

State at sight the sums in Exs. 11-15:

- | | | | | |
|--|--|--|--|--|
| 11. $\begin{array}{r} \$19 \\ 4 \\ \hline \end{array}$ | 12. $\begin{array}{r} \$15 \\ 8 \\ \hline \end{array}$ | 13. $\begin{array}{r} \$17 \\ 6 \\ \hline \end{array}$ | 14. $\begin{array}{r} \$19 \\ 7 \\ \hline \end{array}$ | 15. $\begin{array}{r} \$16 \\ 8 \\ \hline \end{array}$ |
|--|--|--|--|--|

The teacher should give frequent oral drills of this kind.

Add rapidly:

- | | | | | |
|--|--|--|--|--|
| 16. $\begin{array}{r} 14 \\ 352 \\ \hline \end{array}$ | 17. $\begin{array}{r} 27 \\ 402 \\ \hline \end{array}$ | 18. $\begin{array}{r} 32 \\ 556 \\ \hline \end{array}$ | 19. $\begin{array}{r} 48 \\ 241 \\ \hline \end{array}$ | 20. $\begin{array}{r} 73 \\ 124 \\ \hline \end{array}$ |
|--|--|--|--|--|

In writing a column of numbers representing dollars and cents, you have seen that the sign \$ is placed before the first number and the result only. You have also seen the same for numbers expressing units like feet and pounds. When written in a horizontal line the sign is used with each number, thus: \$2 + \$3 + \$10 = \$15.

WRITTEN EXERCISE

1. $\$2.73 + \$4.96 + \$5.75 + \$3.49.$
2. $\$4.87 + \$14.92 + \$25 + \$17.64.$
3. $\$100 + \$175.50 + \$325 + \$4.75.$

ORAL EXERCISE

SOME HOME MEALS

1. The coffee for our breakfast cost 6 ct., the potatoes 4 ct., the meat 32 ct., and the bread 4 ct. How much did the bread and meat cost? How much did all the food cost?

2. The oatmeal for a breakfast cost 8 ct., the milk 4 ct., the fruit 10 ct., the rolls and butter 5 ct., and the eggs 8 ct. How much did this food cost?

3. For a dinner the meat cost 30 ct., the vegetables 20 ct., the dessert 20 ct., the coffee 15 ct., and the other food 15 ct. Find the total cost.

4. The meals for a small family cost \$1.70 on one day and \$2.20 on another day. How much did they cost for these two days?

WRITTEN EXERCISE

Add:

1. \$3.04	2. \$3.40	3. \$34.45	4. \$45.75
6.03	6.30	63.35	34.50
<u>7.04</u>	<u>7.40</u>	<u>74.45</u>	<u>29.86</u>
5. \$127.00	6. \$49.80	7. \$286.00	8. \$480.00
42.30	8.65	431.00	275.00
69.90	4.32	125.50	496.00
40.00	15.00	62.75	52.50
<u>8.75</u>	<u>4.00</u>	<u>148.00</u>	<u>7.70</u>

SUBTRACTION

ORAL EXERCISE

Subtract :

- | | | | | |
|------------|------------|------------|------------|------------|
| 1. 353 | 2. 462 | 3. 780 | 4. 690 | 5. 187 |
| <u>121</u> | <u>240</u> | <u>630</u> | <u>370</u> | <u>45</u> |
| | | | | |
| 6. \$4.75 | 7. \$350 | 8. \$280 | 9. \$4.50 | 10. \$6.35 |
| <u>.25</u> | <u>50</u> | <u>20</u> | <u>.40</u> | <u>.30</u> |

Write the above examples and the following explanation on the board as usual. Frequent oral drills of this kind should be given.

In subtracting \$176.75 from \$247.50,

You may think this:

But write only this:

$$\begin{array}{r}
 \$247.50 = \$100 + \$140 + \$6 + 150 \text{ ct.} \\
 176.75 = \underline{100 + 70 + 6 + 75} \\
 \qquad \qquad \qquad \$70 \quad + \quad 75 \text{ ct.}
 \end{array}
 \qquad
 \begin{array}{r}
 \$247.50 \\
 176.75 \\
 \hline
 \$70.75
 \end{array}$$

That is, in subtracting United States money, write the decimal points in a column and subtract the numbers in the usual way.

WRITTEN EXERCISE

- \$24.75 - \$6.90.
- \$35.50 - \$17.
- \$145.10 - \$75.50.
- \$129 - \$0.75.
- A man's income was \$1500 and his expenses were \$1275. How much did he save?
- A man's salary was \$1400 a year, and he received \$180 from a house that he rented. His expenses were \$1142. How much did he save?

ORAL EXERCISE

- | | | | | |
|-------------|--------------|--------------|--------------|-------------|
| 1. 7654 | 2. 9860 | 3. 4863 | 4. 5957 | 5. 1283 |
| <u>-231</u> | <u>-7340</u> | <u>-2541</u> | <u>-2845</u> | <u>-101</u> |

Pupils should be required to state such differences quickly, without taking time to repeat the numbers. Frequent drills on such blackboard problems should be given.

In the written exercise following, and in similar cases, the element of time is important. Unduly slow work is usually inaccurate. The pupil always has a simple test of accuracy in checking by addition.

WRITTEN EXERCISE

Subtract :

- | | | | |
|--------------|---------------|--------------|--------------|
| 1. \$72.41 | 2. \$29.84 | 3. \$94.76 | 4. \$60.70 |
| <u>24.92</u> | <u>12.97</u> | <u>76.98</u> | <u>55.81</u> |
| 5. \$50.01 | 6. 6542 | 7. 9008 | 8. 5286 |
| <u>20.09</u> | <u>5997</u> | <u>2519</u> | <u>2394</u> |
| 9. 7629 | 10. 8536 | 11. 7629 ft. | 12. 1436 yd. |
| <u>7537</u> | <u>687</u> | <u>6289</u> | <u>563</u> |
| 13. 7024 lb. | 14. 9673 gal. | 15. \$8841 | 16. 9527 |
| <u>1065</u> | <u>7796</u> | <u>7952</u> | <u>986</u> |
| 17. 3342 | 18. 4763 | 19. 2696 | 20. 6000 |
| <u>929</u> | <u>824</u> | <u>1727</u> | <u>4236</u> |
| 21. \$21.40 | 22. \$40.00 | 23. \$90.00 | 24. \$24.00 |
| <u>17.52</u> | <u>5.75</u> | <u>36.27</u> | <u>.78</u> |

ORAL EXERCISE

1. Ralph is training his company for the Fourth. They have bought a dozen boxes of caps at 2 ct. a box, and 10 guns at 50 ct. each. How much did they pay for the caps and the guns?

2. Jim, who carries the flag, bought a gun and 8 boxes of caps. How much did these cost him?



3. Will, who plays the drum, has bought 3 big firecrackers at 6 ct. each. He handed the dealer a quarter. How much change did he get?

4. Jack had 20 ct., and he bought 3 packs of 5-ct. firecrackers, and bought a big firecracker with the rest. How much did this firecracker cost?

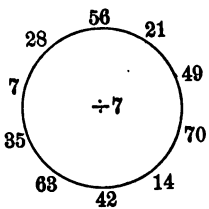
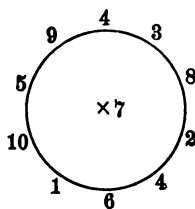
5. George paid 36 ct. for a dozen big firecrackers. How much were they apiece? What would 8 cost?

6. The company collected \$2.50 for 10 pieces of fireworks. What was the average cost of each?

MULTIPLICATION

ORAL EXERCISE

1. State the results as the teacher points to the numbers.



Each figure should be drawn upon the blackboard, the number in the center being frequently changed.

2. How much is 3 times \$12? 3 times \$1.20? 3 times \$0.12?
3. How much is 8 times \$11? 8 times \$1.10?

To multiply United States money, multiply as with other numbers, placing the decimal point after the dollars.

In this example, 3 times 5 ct. = 15 ct.; 3 times 20 ct. = 60 ct., which with the 10 ct. = 70 ct.; 3 times \$2 = \$6. Therefore, the product is \$6.75.

$$\begin{array}{r} \$2.25 \\ \times 3 \\ \hline \$6.75 \end{array}$$

WRITTEN EXERCISE

Multiply in Exs. 1-9:

1. \$2.25 by 5. 2. \$2.25 by 4. 3. \$4.75 by 3.
4. \$14.92 by 6. 5. \$12.05 by 8. 6. \$8.93 by 9.
7. \$3.02 by 7. 8. \$23.46 by 8. 9. \$12.05 by 8.
10. At \$10.50 a ton, how much will 7 tons of hay cost?
11. At \$0.83 a bushel, how much will 7 bu. of wheat cost?

ORAL EXERCISE

1. Multiply by 10: 2, 20, 25, 125.
2. Multiply by 10: 20 ct., \$1.00, \$1.20, \$2.25, \$3.50.
3. Multiply by 10: \$3.00, \$3.75, \$14.00, \$35.50, \$2.00, \$2.50.

Because 10 times 25 is 250, and 10 times \$2.25 is \$22.50, therefore,

To multiply by 10, annex a zero. If there is a decimal point, move it one place to the right.

Although 10 times 25 ct. = 250 ct., the result is usually written \$2.50, and so for similar cases.

The work in multiplying by numbers ending in 0 is usually arranged like this:

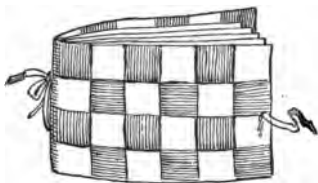
25	32
20	300
500	9600

WRITTEN EXERCISE

1. At 30 ct. a dozen, how much will 10 doz. pencils cost?
2. At 35 ct. a box, how much will 10 boxes of crayons cost?
3. At 10 ct. apiece, how much will 2 doz. black-board pointers cost?
4. At 10 ct. a small package, how much will half a dozen small packages of pens cost?
5. How many fingers in a class of 27? How many toes? How many fingers and toes?
6. If an arithmetic costs 35 ct., how much must be paid for 10 arithmetics? for 2? for a dozen?

ORAL EXERCISE

1. The class made some needlebooks. Each cover had 12 gray strips of paper and $\frac{1}{3}$ as many red ones. How many red ones?



2. The red strips were 6 in. long, and the gray ones were $\frac{1}{3}$ as long. How long were the gray ones?
3. The strips were $\frac{1}{2}$ in. wide. How long was the book? How wide? How many square inches on this side of the cover? on all the outside?
4. The flannel leaves are $\frac{1}{2}$ in. less in length and $\frac{1}{4}$ in. less in width than the cover. How long are they? How wide?
5. They bought $\frac{1}{2}$ yd. of flannel for the leaves at 50 ct. a yard. How much did it cost?
6. It takes $\frac{1}{4}$ yd. of ribbon to tie each book. How many can be tied with 1 yd.? with 2 yd.? with 4 yd.?
7. How many strips of gray paper would be needed for 10 books? How many of red paper?
8. The paper cost 1 ct. for 4 books. There were 40 books made. How much did all of the paper cost?
9. The ribbon for tying the leaves cost 2 ct. a yard, and $\frac{1}{4}$ yd. was used for each book. How much did the ribbon cost per book? for 40 books?

ORAL EXERCISE

1. 2 times 5 and 3 times 5 are how many times 5?
2. 20 times 7 and 3 times 7 are how many times 7?
3. 20 times 326 and 3 times 326 are how many times 326?

You have found that 23 times 326 is the sum of 20 times 326 and 3 times 326. Therefore, to multiply 326 by 23,

You may think this:

$$\begin{array}{r}
 326 \\
 23 \\
 \hline
 978 \text{ product by } 3 \\
 6520 \quad \text{"} \quad \text{"} \quad 20 \\
 7498 \quad \text{"} \quad \text{"} \quad 23
 \end{array}$$

But write only this:

$$\begin{array}{r}
 326 \\
 23 \\
 \hline
 978 \\
 652 \\
 \hline
 7498
 \end{array}$$

WRITTEN EXERCISE

Multiply in Exs. 1-15:

- | | | | | |
|-----------|-----------|-----------|-----------|-----------|
| 1. 127 | 2. 402 | 3. 350 | 4. 252 | 5. 317 |
| <u>13</u> | <u>21</u> | <u>32</u> | <u>35</u> | <u>42</u> |
| 6. 237 | 7. 635 | 8. 522 | 9. 398 | 10. 129 |
| <u>43</u> | <u>14</u> | <u>11</u> | <u>19</u> | <u>67</u> |

11. At \$275 an acre, how much will 27 acres of garden property cost?
12. A dealer buys 1 doz. typewriters at \$82 each, and sells them at \$100 each. What does he gain?

ORAL EXERCISE

1. Multiply by 3: 7, 70, 10, 11, 12, 9, 900.
2. Multiply by 4: 40, 400, 30, 300, 70, 700.
3. Multiply by 6: 2, \$2, 2 ct., \$2.02, \$3.03, \$4.04, \$6.06.
4. Multiply by 8: 3, \$3, 10 ct., \$3.10, \$3.06, \$5.07, \$9.08.

In multiplying \$2.35 by 27,

This shows all the work:

But we write only this:

\$2.35		\$2.35
27		27
<hr/>		<hr/>
\$16.45	product by 7	16 45
47.00	“ “ 20	47 0
<hr/>		<hr/>
\$63.45	“ “ 27	\$63.45

WRITTEN EXERCISE

Multiply in Exs. 1-10:

1. \$4.82 by 15.
2. \$3.27 by 22.
3. \$4.09 by 19.
4. \$3.96 by 21.
5. \$2.81 by 38.
6. \$1.39 by 39.
7. \$2.99 by 27.
8. \$1.75 by 34.
9. \$0.69 by 72.
10. \$0.75 by 32.
11. At \$24 a dozen, how much will 24 silver tablespoons cost? 9? 33?
12. At \$36 a dozen, how much must a dealer pay for 4 cut-glass vases? for 16?
13. Three armchairs can be bought for \$21. At this rate, how much will 14 such chairs cost?

WRITTEN EXERCISE

Did you ever see men harvest ice? After it has frozen 10 or 12 inches thick it is cleared of snow by a



scraper drawn by a horse, and then split or sawed. The cakes are then packed in an ice house, covered with sawdust, and kept until summer.

1. How many square feet of frozen surface are there on a pond 260 ft. long, having an average width of 30 ft.?

2. If the ice is 12 in. thick, how many cubic feet of ice can be cut from the pond?

3. Ice weighs 62 lb. per cubic foot. What is the weight of one of these cakes of ice 1 yd. square, the ice being 1 ft. thick?

4. Not all of the ice of Ex. 2 is sold. A quarter is lost in cutting and by melting. How many cubic feet are lost?

DIVISION

ORAL EXERCISE

1. How much is $\frac{1}{2}$ of 10? ||||| |||||.
2. How many 2's in 10? || || || || ||.
3. How many \$2 bills are worth \$10? \$20?
4. How many 2's in 12? in 16? in 20? in 40?
5. How much is $\frac{1}{2}$ of \$12? $\frac{1}{2}$ of 16 ft.?

Because $2 \text{ ft.} + 2 \text{ ft.} + 2 \text{ ft.} = 6 \text{ ft.}$, or 3 times 2 ft.
 $= 6 \text{ ft.}$, we see that

1. 2 ft. is contained 3 times in 6 ft.
2. If 6 ft. are separated into 3 equal parts, there are 2 ft. in each part; that is, $\frac{1}{3}$ of 6 ft. = 2 ft.

The teacher may find it advisable to postpone the following discussion of division.

There are, therefore, *two kinds of division*:

1. *Measuring*, as when we measure 6 ft. by 2 ft.

Thus, $6 \text{ ft.} \div 2 \text{ ft.} = 3$.

2. *Separating*, as in separating 6 ft. into 3 equal parts.

Thus, $\frac{1}{3}$ of 6 ft. = 2 ft., or $6 \text{ ft.} \div 3 = 2 \text{ ft.}$

WRITTEN EXERCISE

Divide, putting the dollar signs in the right places:

1. $\$648 \div 8$.
2. $\$756 \div \4 .
3. $\$6304 \div 8$.
4. $\$8748 \div 9$.
5. $\$4830 \div \7 .
6. $\$3003 \div \7 .
7. If one barrel of apples cost \$4, how many barrels can be bought for \$284?
8. If 4 car loads of apples cost \$3200, how much will one car load cost? How much will 7 cost?

ORAL EXERCISE

1. $204 \div 2$. 2) $\$2 + 4$ ct. $\$2.04 \div 2$.
2. $609 \div 3$. 3) $\$6 + 9$ ct. $\$6.09 \div 3$.
3. $\$8.40 \div 4$, $\$5.50 \div 5$, $\$6.66 \div 6$, $\$8.08 \div 8$.
4. How many times is $\$2$ contained in $\$200$?
5. How many times is $\$6$ contained in $\$66$?
6 ft. in 66 ft.? 6 bu. in 66 bu.?

You have seen that $\$2.04 \div 2 = \1.02 . That is,

To divide United States money, divide in the usual way, placing the decimal point after dollars' place in the quotient.

For example, in dividing $\$17.28$ by 6, we see that we cannot exactly divide $\$17$ by 6, but $\$12 \div 6 = \2 , leaving $\$5.28$ to be divided.
$$\begin{array}{r} 6 \overline{) \$17.28} \\ \underline{\$12.00} \\ \$5.28 \end{array}$$
 We cannot exactly divide 52 dimes by 6, but $48 \text{ dimes} \div 6 = 8 \text{ dimes}$, leaving 48 ct. to be divided. $48 \text{ ct.} \div 6 = 8 \text{ ct.}$ Therefore, the quotient is $\$2.88$.

As on page 123, teachers are advised to develop this work first by using the long-division form, changing to the form above given as soon as the operation is understood.

WRITTEN EXERCISE

1. $\$17.28 \div 8$. 2. $\$17.28 \div 4$. 3. $\$27.93 \div 3$.
4. $\$16.40 \div 8$. 5. $\$37.44 \div 9$. 6. $\$42.35 \div 7$.
7. $\$326.25 \div 9$. 8. $\$13.20 \div 6$. 9. $\$17.28 \div 12$.
10. If 3 head of cattle cost $\$82.50$, how much will 1 head cost? How much will 10 head cost?
11. If 8 barrels of apples cost $\$36$, how much will 1 barrel cost? How much will 5 barrels cost?

ORAL EXERCISE

1. How many 10's in 20? in 50? in 500? in 600?
2. How many 10's in 450? in 570? in 680? in 1000?
3. If a number ends in 0, how can you easily tell how many 10's it contains?
4. How many 2's in 4? 2 ft. in 4 ft.? 2 tens in 4 tens? 20's in 40? 20's in 400?
5. How many 3's in 9? 30's in 90? 30's in 900?
6. How many 4's in 36? 40's in 360? 40's in 3600?
7. How many 5's in 35? 50's in 350? 50's in 3500?
8. If you are dividing a number ending in 0 by another number ending in 0, what may you do with both 0's?

Therefore, when there are no fractions,

To divide a number ending in 0 by 10, simply cancel the 0.

To divide a number ending in 0 by another number ending in 0, cancel a 0 at the end of each and divide.

$$\begin{array}{r} 10 \overline{)470} \\ 47 \end{array}$$

$$\begin{array}{r} 20 \overline{)580} \\ 29 \end{array}$$

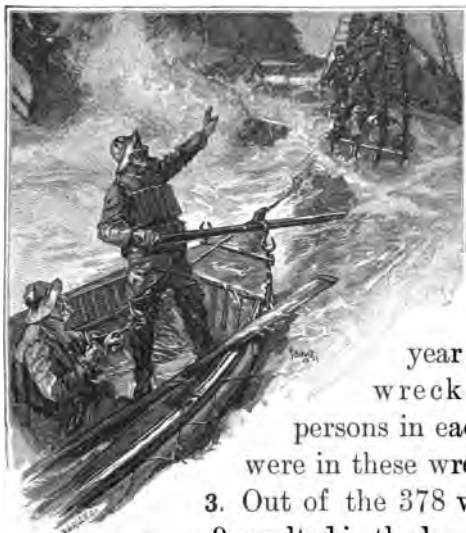
WRITTEN EXERCISE

- | | | |
|--------------------------|--------------------------|--------------------------|
| 1. $840 \div 40$. | 2. $100 \div 50$. | 3. $7000 \div 20$. |
| 4. $360 \div 60$. | 5. $750 \div 50$. | 6. $9600 \div 30$. |
| 7. $1110 \div 30$. | 8. $1330 \div 70$. | 9. $7280 \div 80$. |
| 10. $2220 \div 60$. | 11. $1050 \div 70$. | 12. $\$6150 \div 50$. |
| 13. $\$4140 \div \90 . | 14. $\$2360 \div \40 . | 15. $\$3040 \div \80 . |

WRITTEN EXERCISE

Our government has a large number of life-saving stations along our coast. Rescues are generally made by boat, but sometimes by a line fired over the ship.

1. We have 195 stations on the Atlantic and



Gulf coasts, 58 on the Great Lakes, 16 on the Pacific, and 1 on the Ohio river. How many are there in all?

2. In one year there were 378 wrecks, averaging 8 persons in each. How many were in these wrecks?

3. Out of the 378 wrecks, 1 out of every 9 resulted in the loss of a ship. How many ships were lost? (How many 9's in 378?)

4. The night signals warned 210 ships from danger; the day signals warned $\frac{1}{10}$ as many. How many were warned by both?

5. The wreck guns were used to fire life lines 15 times. On each of 6 times 1 shot was fired. Two shots were fired each of the other times. How many shots were fired in all?

ORAL EXERCISE

1. How many 11's in 22? in 33? in 77? in 99?

2. How many 11's in 11? in 110? in 550?

3. Divide:

$$11 \overline{)550 + 22}$$

$$11 \overline{)660 + 33}$$

$$11 \overline{)7700 + 440}$$

4. Divide:

$$11 \overline{)3300 + 110 + 22} \quad \text{How much is } 3300 + 110 + 22?$$

Ex. 4 shows that we may separate the dividend into parts as with a one-figure divisor. But it is easier to divide like this, writing the quotient at the top.

This is the complete work: *But we write only this:*

$ \begin{array}{r} 312 \\ 11 \overline{)3432} \text{ to be divided} \\ \underline{3300} = 300 \text{ times } 11 \\ 132 \text{ still to be divided} \\ \underline{110} = 10 \text{ times } 11 \\ 22 \text{ still to be divided} \\ \underline{22} = 2 \text{ times } 11 \end{array} $	$ \begin{array}{r} 312 \\ 11 \overline{)3432} \\ \underline{33} \\ 13 \\ \underline{11} \\ 22 \\ \underline{22} \end{array} $
--	---

We see that $3000 \div 11 = \text{no thousands}$, but that $3400 \div 11 = 300$, and 100 + 32 remaining to be divided; $132 \div 11 = 10$, and 22 still remaining to be divided; $22 \div 11 = 2$. Therefore, the quotient is 312.

WRITTEN EXERCISE

1. $231 \div 11$.

2. $561 \div 11$.

3. $781 \div 11$.

4. $1232 \div 11$.

5. $3762 \div 11$.

6. $9636 \div 11$.

7. $5346 \div 11$.

8. $6006 \div 11$.

9. $7117 \div 11$.

ORAL EXERCISE

1. $2100 \div 21$. $21 \overline{)2100+21}$ $21 \overline{)2100+42}$
2. $3100 \div 31$. $31 \overline{)3100+62}$ $31 \overline{)3100+620}$
3. $4100 \div 41$. $41 \overline{)4100+82}$ $41 \overline{)4100+410+82}$
4. $6300 \div 21$. $21 \overline{)6300+21}$ $21 \overline{)6300+420+21}$

As we divided by 11 (page 146), so we may divide by other numbers. For example, divide 6741 by 21.

The teacher is advised to develop on the board the full form, as on page 146, leading the children to discover the successive steps and to state simple reasons for taking them. The unnecessary figures should then be erased, leaving the form here shown. Children should not be asked to explain the process: it is sufficient that they understand it as presented, the work then becoming mechanical, as it is with adults. The explanation given on page 146 may serve as an outline.

$$\begin{array}{r}
 321 \\
 21 \overline{)6741} \\
 \underline{63} \\
 44 \\
 \underline{42} \\
 21 \\
 \underline{21} \\
 0
 \end{array}$$

WRITTEN EXERCISE

1. $4935 \div 21$. 2. $2646 \div 21$. 3. $7287 \div 21$.
4. $4898 \div 31$. 5. $3689 \div 31$. 6. $6758 \div 31$.
7. $5125 \div 41$. 8. $4838 \div 41$. 9. $4879 \div 41$.
10. $5049 \div 51$. 11. $5661 \div 51$. 12. $6273 \div 51$.
13. $5429 \div 61$. 14. $7881 \div 71$. 15. $9477 \div 81$.
16. At \$11 each, how many rocking-chairs can be bought for \$385?
17. At \$31 each, how many head of cattle can be bought for \$589?
18. At \$71 each, how many Texas ponies can be bought for \$1491?

ORAL EXERCISE

1. $120 \div 12$, $1200 \div 12$.
2. $12 \overline{)1200 + 120}$, $12 \overline{)2400 + 12}$.
3. $12 \overline{)3600 + 120}$, $12 \overline{)3600 + 360 + 36}$.
4. $220 \div 22$, $22 \overline{)2200 + 22}$, $22 \overline{)4400 + 66}$.
5. $64 \div 32$, $32 \overline{)6400 + 32}$, $32 \overline{)6400 + 320 + 32}$.
6. $84 \div 42$, $42 \overline{)8400 + 42}$, $42 \overline{)8400 + 420 + 84}$.
7. $104 \div 52$, $1040 \div 52$, $52 \overline{)1040 + 52}$.

Examples like the above should be written on the board as usual. They lead immediately to the following case of division. The full form should first be given, as suggested on page 147, the unnecessary figures then being erased. The following explanation may serve as an outline. It is sufficient at this time to consider only two-figure divisors with the unit's figure 0, 1, or 2.

Required to divide 3328 by 32.

$$\begin{array}{r}
 104 \\
 32 \overline{)3328} \\
 \underline{32} \\
 128 \\
 \underline{128} \\
 0
 \end{array}$$

We see that $3000 \div 32 =$ no thousands, but $3300 \div 32 =$ about 100, so we write 1 in hundreds' place. Taking away 100 times 32, there is still 128 to be divided. We see that $120 \div 32 =$ no tens, and we write a 0 in tens' place. There is still 128 to be divided, and $128 \div 32 = 4$.

WRITTEN EXERCISE

1. $4836 \div 12$.
2. $6036 \div 12$.
3. $4824 \div 12$.
4. $1224 \div 12$.
5. $6384 \div 12$.
6. $2442 \div 22$.
7. $3840 \div 32$.
8. $2142 \div 42$.
9. $5304 \div 52$.

ORAL EXERCISE

1. $510 \div 51$, $5100 \div 51$, $5200 \div 52$.
2. $102 \div 51$, $1020 \div 51$, $1530 \div 51$.
3. $122 \div 61$, $1220 \div 61$, $1240 \div 62$.
4. $142 \div 71$, $1420 \div 71$, $1440 \div 72$.

5. At \$72 a head, how many ponies can be bought for \$144? for \$1440?

6. At \$32 a head, how many head of cattle can be bought for \$64? for \$640? for \$6400?

Pupils should have been led before this to express the following statement in their own language. It is here inserted as a basis for comparison.

You have seen that there are three things to be done in division:

1. *Write each quotient figure over the place that shows its value, as over the hundreds or tens.*

2. *Multiply the divisor and this quotient.*

3. *Subtract this product and proceed as before until a remainder appears that is less than the divisor.*

Teachers should call attention to the fact that it is usually necessary to notice only the first two figures of the dividend and the first figure of the divisor to determine the quotient figure. Also that it is necessary to bring down only one new figure of the dividend with each subtraction.

WRITTEN EXERCISE

1. $4686 \div 22$.
2. $7700 \div 22$.
3. $5280 \div 22$.
4. $6720 \div 32$.
5. $5460 \div 42$.
6. $7992 \div 72$.
7. $9180 \div 51$.
8. $3796 \div 52$.
9. $8464 \div 92$.

ORAL EXERCISE

1. At 20 ct. a dozen, how much will 3 doz. eggs cost? 5 doz.?

2. At \$4 a dozen, how much will 3 handkerchiefs cost?

3. At 21 ct. a dozen, how much will 4 doz. eggs cost? 3 doz.? 10 doz.?

4. At 23 ct. a dozen, how much will 2 doz. eggs cost? 3 doz.? 10 doz.?

5. At \$18 a dozen, how much will 18 cut-glass tumblers cost?

6. At \$24 a dozen, how much will 10 fine linen napkins cost?

7. At \$9 a dozen, how much will $\frac{1}{2}$ doz. cups and saucers cost?

8. At 40 ct. a dozen, how much will 3 doz. oranges cost? $\frac{1}{2}$ doz.? $1\frac{1}{2}$ doz.?

9. At 60 ct. a dozen, how much will $\frac{1}{2}$ doz. oranges cost? How much will 2 doz. cost?

10. At 50 ct. a dozen, how many oranges can be bought for \$1? for \$1.50? for \$2?

11. At 22 ct. a dozen, how many eggs can be bought for 66 ct.? for 11 ct.? for 77 ct.?

12. At 30 ct. a dozen, how many bananas can be bought for 60 ct.? for 15 ct.? for 75 ct.?

13. At 30 ct. a dozen, how much will 6 doz. bananas cost? At 25 ct. a dozen, how much will 4 doz. cost?

ORAL EXERCISE

1. If some children pay 45 ct. for a Christmas tree and give the dealer \$1, how much change is due?

2. If they buy 9 candy canes at 8 ct. each, how much will they cost? How much change should they get for \$1?



3. If they buy their mother 4 handkerchiefs at 25 ct. each, how much will they cost?

4. They buy 10 colored balls at 4 ct. each, and 5 strings of tinsel at 5 ct. a string. How much do both cost?

WRITTEN EXERCISE

1. How much did the tree, the canes, the balls, and the tinsel together cost?

2. The children bought $2\frac{1}{2}$ doz. candles at 18 ct. a dozen for the tree. How much did they cost?

3. They bought some toys costing 15 ct., 23 ct., 32 ct., 30 ct., 10 ct., 25 ct. How much did all these cost?

4. If the children had saved \$6.50 to spend for all these things, how much was left?

FRACTIONS

ORAL EXERCISE

1. What part of A is shaded? of B? of C?



A



B



C

2. Which rectangle shows that $\frac{2}{6} = \frac{1}{3}$? that $\frac{3}{6} = \frac{1}{2}$?

3. Which shows that $\frac{1}{6} + \frac{5}{6} = 1$? that $\frac{1}{2} + \frac{1}{3} + \frac{1}{6} = 1$?

4. Calling each small square 1, which rectangle shows that $\frac{1}{6}$ of 6 = 1?

5. Which shows that $\frac{5}{6}$ of 6 = 5? that $\frac{1}{3}$ of 6 = 2? that $\frac{1}{2}$ of 6 = 3? that $\frac{2}{3}$ of 6 = 4?

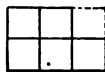
6. In what other ways could you shade the squares in A to show $\frac{1}{2}$? in B to show $\frac{1}{3}$?

7. Show from the rectangles that $\frac{1}{2} + \frac{1}{6} = \frac{2}{3}$; $\frac{1}{2} - \frac{1}{6} = \frac{1}{3}$; $\frac{2}{3} + \frac{1}{6} = \frac{5}{6}$.

WRITTEN EXERCISE

1. This rectangle shows that $1 - \frac{1}{6} = \frac{5}{6}$. Draw a rectangle showing that $1 - \frac{1}{3} = \frac{2}{3}$.

2. In the same way draw rectangles showing the following:



$$\frac{5}{6} - \frac{1}{6} = \frac{4}{6}, \text{ or } \frac{2}{3},$$

$$\frac{2}{3} - \frac{1}{6} = \frac{1}{2},$$

$$\frac{1}{2} - \frac{1}{6} = *,$$

$$\frac{1}{3} + \frac{1}{6} = *,$$

$$\frac{1}{3} - \frac{1}{6} = *,$$

$$\frac{1}{2} + \frac{1}{6} = *.$$

3. Draw rectangles to show the following:

$$\frac{1}{2} + \frac{1}{4},$$

$$\frac{1}{4} + \frac{1}{4},$$

$$\frac{1}{4} + \frac{1}{8},$$

$$\frac{1}{4} - \frac{1}{8},$$

$$1 - \frac{1}{4},$$

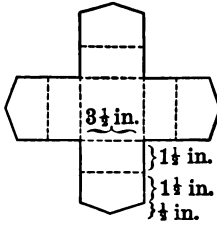
$$1 - \frac{1}{8},$$

$$1 - \frac{3}{4},$$

$$1 - \frac{5}{8}.$$

WRITTEN EXERCISE

1. Jennie made a box for her mother, $3\frac{1}{2}$ in. square and $1\frac{1}{2}$ in. high. She drew this plan, cut it out, and folded it along the dotted lines. Draw the plan, full size.



2. She covered the outside of the box with ribbon, buying 8 in. of one kind and 28 in. of another kind. How many yards did she buy?

3. This ribbon cost 30 ct. a yard. How much did it all cost?

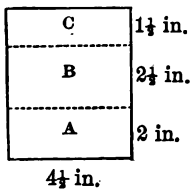
4. She also lined the inside with 4 pieces of ribbon, each $3\frac{1}{2}$ in. long. How much did she need for the inside, allowing an extra inch in all for the turning in?



5. If she had allowed twice as much for the outside as for the inside, as stated in Ex. 4, how much would she have needed for both?

6. How much would the ribbon in Exs. 4 and 5 cost at 20 ct. a yard?

7. Rose made a bag for her brother's scarf pins.



She took a piece of chamois skin $4\frac{1}{2}$ in. by 6 in., and marked it as shown. She folded A over B and sewed it so as to make a pocket, folding C down for a cover. Draw the plan, full size.

12. $\frac{6}{12} = \frac{1}{2}$.

ORAL EXERCISE

1. How many are $\frac{1}{2}$ of a dozen rabbits? $\frac{1}{3}$ of a dozen? $\frac{1}{4}$ of a dozen?



2. How many are $\frac{2}{3}$ of a dozen rabbits? $\frac{3}{4}$ of a dozen? $\frac{1}{5}$ of a dozen?

3. How many are $\frac{5}{6}$ of a dozen? $\frac{1}{12}$ of a dozen? $\frac{5}{12}$ of a dozen?

4. State $\frac{1}{2}$ of 24, 30, 40, 100. Also $\frac{1}{3}$ of 24, $\frac{2}{3}$ of 30, $\frac{1}{3}$ of 60, $\frac{2}{3}$ of 60.

5. How much is $\frac{1}{4}$ of 40? $\frac{3}{4}$ of 40? $\frac{2}{4}$ or $\frac{1}{2}$ of 40?

6. How much is $\frac{1}{5}$ of 50? $\frac{2}{5}$ of 50? $\frac{3}{5}$ of 50?

7. How much is $\frac{1}{6}$ of 18? $\frac{2}{6}$ or $\frac{1}{3}$ of 18? $\frac{3}{6}$ or $\frac{1}{2}$ of 18? $\frac{4}{6}$ or $\frac{2}{3}$ of 18?

8. How many minutes in $\frac{1}{2}$ hr.? $\frac{1}{4}$ hr.? $\frac{3}{4}$ hr.?

WRITTEN EXERCISE

1. $\frac{1}{3}$ of 729, $\frac{2}{3}$ of 729.

2. $\frac{1}{4}$ of 836, $\frac{3}{4}$ or $\frac{1}{2}$ of 836, $\frac{3}{4}$ of 836.

3. $\frac{1}{5}$ of 235, $\frac{2}{5}$ of 235, $\frac{3}{5}$ of 235, $\frac{4}{5}$ of 235.

4. $\frac{1}{6}$ of 732, $\frac{2}{6}$ or $\frac{1}{3}$ of 732, $\frac{3}{6}$ or $\frac{1}{2}$ of 732, $\frac{4}{6}$ or $\frac{2}{3}$ of 732.

5. If Ralph drove 24 mi. one day, and Rob drove $\frac{3}{4}$ as far, and Harry drove $\frac{2}{3}$ as far as Rob, how far did Rob and Harry each drive?

ORAL EXERCISE

1. How many feet are $1\frac{1}{2}$ ft. + $\frac{1}{2}$ ft.?
2. What is the sum of $\frac{1}{2} + \frac{1}{4}$? $2\frac{1}{2} + 1\frac{1}{4}$? $3\frac{1}{2} + 2\frac{1}{4}$?
3. How many dollars are $\$ \frac{1}{3} + \$ \frac{1}{3} + \$ \frac{1}{3}$? How many inches are $\frac{2}{3}$ in. + $\frac{1}{3}$ in.?
4. What is the sum of $\frac{1}{3} + \frac{1}{3} + \frac{1}{3}$? of $\frac{2}{3} + \frac{1}{3}$? of $1\frac{2}{3} + \frac{1}{3}$? of $2\frac{2}{3} + 3\frac{1}{3}$? of $4\frac{2}{3} + 5\frac{1}{3}$? of $\frac{2}{3}$ and $\frac{2}{3}$?
5. How much is $\$ \frac{1}{4} + \$ \frac{1}{4} + \$ \frac{1}{4} + \$ \frac{1}{4}$? $\$ \frac{3}{4} + \$ \frac{1}{4}$? $2\frac{3}{4} + \frac{1}{4}$? $3\frac{3}{4} + 2\frac{1}{4}$? $\frac{3}{4}$ and $\frac{3}{4}$?

Add the following:

6. $2\frac{1}{3}$	7. $4\frac{1}{2}$	8. $6\frac{3}{4}$	9. $5\frac{2}{3}$	10. $2\frac{1}{2}$
<u>$\frac{2}{3}$</u>	<u>$\frac{1}{2}$</u>	<u>$\frac{3}{4}$</u>	<u>$\frac{2}{3}$</u>	<u>$3\frac{1}{4}$</u>

WRITTEN EXERCISE

1. Draw a 5-in. line, marking it off in inches. Beneath it write the sums of

$$\frac{1}{6} + \frac{2}{6}, \quad \frac{1}{3} + \frac{2}{6}, \quad \frac{4}{6} + \frac{1}{6}, \quad \frac{2}{6} + \frac{2}{6}.$$

2. Draw a 6-in. line, marking it off in inches. Beneath it write the sums of

$$\frac{1}{6} + \frac{2}{6}, \quad \frac{1}{6} + \frac{1}{3}, \quad \frac{1}{6} + \frac{2}{6}, \quad \frac{1}{6} + \frac{1}{2}, \quad \frac{1}{6} + \frac{5}{6}.$$

3. Draw lines showing the sums of

$$\frac{1}{8} + \frac{1}{4}, \quad \frac{1}{8} + \frac{3}{8}, \quad \frac{1}{8} + \frac{3}{4}, \quad \frac{1}{8} + \frac{5}{8}, \quad \frac{1}{8} + \frac{7}{8}, \quad \frac{3}{8} + \frac{5}{8}.$$

4. Add:

248 $\frac{1}{6}$	423 $\frac{3}{4}$	192 $\frac{1}{8}$	246 $\frac{3}{8}$
409 $\frac{3}{8}$	201 $\frac{3}{4}$	47 $\frac{1}{2}$	47
<u>620$\frac{1}{6}$</u>	<u>47</u>	<u>10$\frac{1}{8}$</u>	<u>21$\frac{3}{8}$</u>

ORAL EXERCISE

1. How many cents in $\frac{1}{2}$ of a dollar? in $\frac{1}{4}$ of a dollar? in $\frac{3}{4}$ of a dollar?

2. How much is $\frac{1}{5}$ of 10? $\frac{1}{5}$ of 100? $\frac{1}{5}$ of 100 ct.? $\frac{1}{5}$ of a dollar?

3. How much is 2 times 20 ct.? $\frac{2}{5}$ of \$1? $\frac{3}{5}$ of \$1? $\frac{4}{5}$ of \$1?

4. On the blackboard divide 100 by 3. How much is $\frac{1}{3}$ of \$1?

5. On the blackboard divide 100 by 6. How much is $\frac{1}{6}$ of \$1?

You have now found the following:

$\frac{1}{2}$ of \$1 = \$0.50, or 50 ct. $\frac{1}{3}$ of \$1 = \$0.33 $\frac{1}{3}$, or 33 $\frac{1}{3}$ ct.

$\frac{1}{4}$ of \$1 = \$0.25, or 25 ct. $\frac{1}{5}$ of \$1 = \$0.20, or 20 ct.

$\frac{1}{6}$ of \$1 = \$0.16 $\frac{2}{3}$, or 16 $\frac{2}{3}$ ct. $\frac{3}{4}$ of \$1 = \$0.75, or 75 ct.

WRITTEN EXERCISE

1. From $\frac{3}{4}$ of \$1 subtract $\frac{1}{5}$ of \$1.

2. Add: $\frac{1}{2}$ of \$1 + $\frac{1}{4}$ of \$1 + $\frac{1}{5}$ of \$1.

3. Add the following:

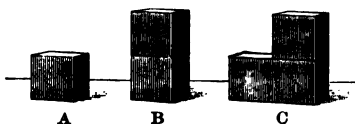
\$0.50	\$0.75	\$0.25	\$0.16 $\frac{2}{3}$
.25	.33 $\frac{1}{3}$.50	.20
.16 $\frac{2}{3}$.16 $\frac{2}{3}$.75	.25
<u>.20</u>	<u>.25</u>	<u>.20</u>	<u>.33$\frac{1}{3}$</u>

4. Subtract:

\$1.00	\$0.33 $\frac{1}{3}$	\$1.00	\$427.36
<u>.50</u>	<u>.13$\frac{1}{3}$</u>	<u>.20</u>	<u>39.48</u>

ORAL EXERCISE

1. In this picture, if B represents \$1, how much is represented by A? How many cents?



2. If B represents \$1, how much is represented by C? How many dollars and cents?

3. If C represents 90 ct., how much is represented by A? by B? by A + B? by A + B + C?

4. If C weighs 12 oz., how much does A weigh? B? A + B? A + C?

5. If A + B + C represents 1, what does A represent? B? C? A + B? A + C? B + C?

The actual inch cubes, easily procured, offer material for abundant exercise of this kind. The objects should, however, be discarded as soon as they cease to be necessary, the simpler number facts of fractions then being memorized.

WRITTEN EXERCISE

1. In the picture, if the cubes are of iron, and C weighs $\frac{3}{4}$ lb., how many ounces does A weigh? B?

2. If C weighs 1 lb., what is the weight of A? of B? of A + B? of A + C? of B + C? of A + B + C?

3. If A + C represents \$1, what sum is represented by A? by B? by C? by B + C?

4. If these cubes were ounces of gold, B would be worth \$40. How much would A be worth? C? A + C?

ORAL EXERCISE

1. If you have 3 ct. and spend 1 ct., how much have you left? If you have $\frac{3}{4}$ of a dollar and spend $\frac{1}{4}$ of a dollar, how much have you left?

$$2. \frac{3}{4} - \frac{1}{4}, \quad \frac{3}{5} - \frac{1}{5}, \quad \frac{4}{6} - \frac{2}{6}, \quad \frac{5}{6} - \frac{1}{6}.$$

$$3. 2\frac{3}{4} - \frac{1}{4}, \quad 3\frac{4}{5} - \frac{2}{5}, \quad 7\frac{4}{5} - 5\frac{1}{5}, \quad 10\frac{5}{6} - 7\frac{1}{6}.$$

4. How much is left if you take $\frac{1}{4}$ of an apple from $\frac{1}{2}$ of an apple? Then how much is $\frac{1}{2} - \frac{1}{4}$?

$$5. \frac{1}{2} - \frac{1}{4}, \quad 3\frac{1}{2} - \frac{1}{4}, \quad 3\frac{1}{2} - 1\frac{1}{4}, \quad 7\frac{1}{2} - 4\frac{1}{4}.$$

6. If you have $\$ \frac{3}{4}$ and spend $\$ \frac{1}{2}$, what part of a dollar have you left? Then how much is $\frac{3}{4} - \frac{1}{2}$?

$$7. \frac{3}{4} - \frac{1}{2}, \quad 7\frac{3}{4} - \frac{1}{2}, \quad 7\frac{3}{4} - 2\frac{1}{2}, \quad 9\frac{3}{4} - 5\frac{1}{2}.$$

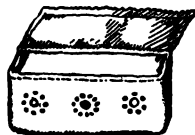
WRITTEN EXERCISE

Subtract in Exs. 1-8:

$$1. \begin{array}{r} 273\frac{3}{4} \\ 47\frac{1}{4} \\ \hline \end{array} \quad 2. \begin{array}{r} 648\frac{3}{5} \\ 199\frac{1}{5} \\ \hline \end{array} \quad 3. \begin{array}{r} 467\frac{4}{5} \\ 188\frac{3}{5} \\ \hline \end{array} \quad 4. \begin{array}{r} 129\frac{5}{8} \\ 39\frac{1}{8} \\ \hline \end{array}$$

$$5. \begin{array}{r} 425\frac{3}{4} \\ 176\frac{1}{2} \\ \hline \end{array} \quad 6. \begin{array}{r} 283\frac{1}{2} \\ 149\frac{1}{4} \\ \hline \end{array} \quad 7. \begin{array}{r} 632\frac{3}{4} \\ 287\frac{1}{2} \\ \hline \end{array} \quad 8. \begin{array}{r} 500\frac{1}{2} \\ 62\frac{1}{4} \\ \hline \end{array}$$

9. Rose has made this thread box. It is $4\frac{1}{2}$ in. long, 2 in. deep, and 2 in. wide. How many square inches of silk will it take to line it? If you wish, you may make a paper pattern.



WRITTEN EXERCISE

1. $\frac{2}{3}$ of 960.
2. $\frac{2}{3}$ of 999.
3. $\frac{3}{4}$ of 324.
4. $\frac{3}{4}$ of 564.
5. $\frac{3}{4}$ of 720.
6. $\frac{3}{4}$ of 916.
7. $\frac{3}{4}$ of 812.
8. $\frac{2}{3}$ of 444.
9. $\frac{2}{3}$ of 507.
10. $\frac{2}{3}$ of 705.
11. $\frac{2}{3}$ of 801.
12. $\frac{2}{3}$ of 873.
13. Add $\frac{2}{3}$ of 612 and $\frac{1}{4}$ of 832.
14. From $\frac{3}{4}$ of 804 take $\frac{2}{3}$ of 171.
15. From $\frac{2}{3}$ of 816 take $\frac{3}{4}$ of 204.
16. $42\frac{3}{4} + 26\frac{1}{4} + 33\frac{3}{4} + 2\frac{1}{4}$.
17. $624\frac{3}{4} - 127\frac{1}{4}$.
18. $17\frac{3}{4} + 18\frac{3}{4} + 26\frac{3}{4} + 2\frac{1}{4}$.
19. $482\frac{2}{3} - 127\frac{1}{3}$.
20. $21\frac{1}{4} + 19\frac{1}{4} + 18\frac{3}{4} + 26$.
21. $634\frac{7}{8} - 293\frac{5}{8}$.
22. $16\frac{3}{8} + 14\frac{7}{8} + 21\frac{1}{8} + 25$.
23. $293\frac{7}{8} - 198\frac{5}{8}$.
24. $29\frac{2}{5} + 36\frac{3}{5} + 18\frac{4}{5} + 7\frac{1}{5}$.
25. $926\frac{4}{5} - 129\frac{1}{5}$.
26. $42\frac{3}{8} + 26\frac{3}{8} + 14\frac{1}{8} + 6\frac{1}{8}$.
27. $200\frac{2}{3} - 175\frac{1}{3}$.
28. $25\frac{1}{5} + 36\frac{2}{5} + 41\frac{2}{5} + 63\frac{1}{5}$.
29. $498\frac{3}{4} - 299\frac{1}{2}$.
30. $31\frac{7}{8} + 26\frac{1}{8} + 23\frac{5}{8} + 41\frac{3}{8}$.
31. $283\frac{2}{3} - 168\frac{1}{3}$.
32. $29\frac{1}{3} + 63\frac{1}{3} + 48\frac{2}{3} + 81\frac{2}{3}$.
33. $400\frac{4}{5} - 193\frac{1}{5}$.
34. How many cubic inches in a box 8 in. long, 4 in. wide, 3 in. deep?

Make problems for Exs. 35-55, and find the answers:

35. $2 \times 5 \times 17$.
36. $3 \times 9 \times 11$.
37. $4 \times 8 \times 12$.
38. $3 \times 6 \times 12$.
39. $8 \times 8 \times 6$.
40. $5 \times 7 \times 11$.
41. $624 \div 3$.
42. $827 \div 2$.
43. $634 \div 5$.
44. $817 \div 4$.
45. $422 \div 3$.
46. $2808 \div 72$.
47. $3159 \div 81$.
48. $2418 \div 62$.
49. $2499 \div 51$.
50. $4331 \div 61$.
51. $1312 \div 32$.
52. $1312 \div 41$.
53. $2394 \div 42$.
54. $1508 \div 52$.
55. $5184 \div 72$.

MEASURES

ORAL EXERCISE

1. What is the area of a rectangle 3 ft. long and 1 ft. wide?

2. What is the area of a rectangle 3 times as wide? How many square feet in 1 sq. yd.?

3. What is the area of a rectangle 12 in. long and 1 in. wide? of one 12 in. by 12 in.?

4. Then how many square inches in 1 sq. ft.? Draw a square foot on the blackboard. Draw a square inch.

5. How many feet in 1 yd.? Then 1 ft. is what part of 1 yd.? How many square feet in 1 sq. yd.? Then 1 sq. ft. is what part of 1 sq. yd.?

144 square inches = 1 square foot (sq. ft.).

9 square feet = 1 square yard (sq. yd.).

WRITTEN EXERCISE

1. How many square inches in 25 sq. ft.?

2. How many square feet in 37 sq. yd.?

3. How many 9's in 144? How many times is 9 sq. ft. contained in 144 sq. ft.? How many square yards in 144 sq. ft.?

4. How many square yards in a rectangle 30 yd. long and 8 yd. wide? Draw it, using $\frac{1}{4}$ in. to a yard.

5. Find the area of a rectangle 52 ft. long, 32 ft. wide; of one 63 yd. long, 58 yd. wide; of one 121 ft. long, 16 ft. wide.

ORAL EXERCISE

1. How much do you think this load of hay weighs? How many pounds?



2. If the hay weighs 1 ton and the wagon weighs 800 lb., how many pounds do both together weigh?
3. Name some things that are sold by the ounce; by the pound; by the ton. How many ounces in a pound? How many pounds in a ton?

2000 pounds = 1 ton (T.).

The ton is used in weighing substances sold in heavy loads, like coal, hay, building stone, and iron.

There is another kind of ton, the *long ton*, containing 2240 lb. It is not much used except in some mines.

WRITTEN EXERCISE

1. At \$9.75 a ton, what will 17 T. of hay cost?
2. At \$5.50 a ton, what will 34 T. of coal cost?
3. At \$36.60 for 6 tons, what will 1 T. cost?

WRITTEN EXERCISE

1. How many pounds in 2 T.? 3 T.?
2. How many square feet in 19 sq. yd.?
3. How many square inches in 17 sq. ft.?

Find the number of square yards in the rectangles in Exs. 4-11:

- | | |
|----------------------|-----------------------|
| 4. 32 yd. by 6 yd. | 5. 27 yd. by 9 ft. |
| 6. 27 ft. by 36 ft. | 7. 36 yd. by 36 ft. |
| 8. 19 yd. by 27 ft. | 9. 54 ft. by 32 yd. |
| 10. 29 yd. by 18 ft. | 11. 132 yd. by 33 ft. |

Multiply in Exs. 12-30:

- | | | |
|-------------------|-------------------|----------------|
| 12. 232 by 48. | 13. 193 by 39. | 14. 281 by 37. |
| 15. 298 by 32. | 16. 341 by 27. | 17. 341 by 17. |
| 18. 342 by 26. | 19. 327 by 25. | 20. 278 by 33. |
| 21. 462 by 19. | 22. 496 by 18. | 23. 419 by 17. |
| 24. 192 by 46. | 25. 387 by 27. | 26. 199 by 49. |
| 27. \$1.27 by 37. | 28. \$3.29 by 19. | |
| 29. \$2.32 by 32. | 30. \$1.92 by 36. | |

Divide in Exs. 31-46:

- | | | |
|-------------------|-------------------|----------------|
| 31. 3426 by 6. | 32. 3437 by 7. | 33. 4328 by 8. |
| 34. 6237 by 9. | 35. 1273 by 5. | 36. 2681 by 4. |
| 37. \$12.75 by 5. | 38. \$16.33 by 3. | |
| 39. \$19.27 by 7. | 40. \$15.26 by 6. | |
| 41. \$125 by \$5. | 42. \$724 by \$4. | |
| 43. \$801 by \$9. | 44. \$133 by \$7. | |
| 45. 3900 by 52. | 46. 2788 by 41. | |

ORAL EXERCISE

1. The milkman sells the milk at 8 ct. a quart.

How much is this a gallon?



2. The dairyman gets only $2\frac{1}{2}$ ct. a quart for the milk. How much is this a gallon? Why is there a difference between city and country prices?

There is a smaller measure than the pint. It is called the *gill*.

4 gills (gi.) = 1 pint (pt.).

2 pints = 1 quart (qt.).

4 quarts = 1 gallon (gal.).

WRITTEN EXERCISE

- How many gills in 7 pt.? in 27 qt.? in $\frac{1}{4}$ qt.?
- How many pints in a gallon? in $\frac{3}{4}$ gal.? in $\frac{1}{2}$ gal.?
- This milkman delivers 200 qt. of milk a day at 8 ct. a quart, and 50 pt. of cream at 40 ct. a quart. How much money does he take in daily?
- If the 200 qt. of milk that this man delivers cost 10 ct. a gallon, how much did the dealer gain on it with which to pay for express and delivery?

ORAL EXERCISE

1. If two men go to the fire on an engine, and four with the hose cart, how many go with both?

2. How long must a ladder be to reach the third floor above the ground, the lowest story being 18 ft., the next 10 ft., and the next 9 ft., allowing 5 ft. extra for the slant?



WRITTEN EXERCISE

1. How long must an extension ladder be to reach the fifth floor above the ground floor, the lowest story being $18\frac{1}{2}$ ft., the next $12\frac{1}{2}$ ft., and the rest 10 ft. each, allowing 5 ft. extra for the slant?

2. The engine uses two lines of hose. Each must be 150 ft. long to reach the building and the fifth floor. How much hose must there be in all?

3. This hose weighs 130 lb. per 100 ft. How much does the hose mentioned in Ex. 2 weigh? It is in 50-ft. lengths. How many lengths?

4. The engine pumps 900 gal. of water a minute. How much can it pump on the fire in an hour?

ORAL EXERCISE

1. These girls have found that a dessert spoon holds two teaspoonfuls. How many teaspoonfuls do they need for a 9-dessert-spoon recipe?



2. A tablespoon holds 4 teaspoonfuls. How many teaspoonfuls do they need for an 8-tablespoon recipe?

3. A small teacup holds 1 gill. How many such teacups to the pint? How many to the quart?

4. A pint of water weighs 1 lb. How much does 1 qt. weigh? How much does 1 gal. weigh?

WRITTEN EXERCISE

1. If 45 drops of water make a teaspoonful, how many drops to $\frac{1}{2}$ of a teaspoonful? to $\frac{3}{4}$?

2. A recipe calls for $1\frac{2}{3}$ teaspoonfuls of extract. This is 1 teaspoonful and how many drops?

3. If a pint of water weighs 1 lb., how many ounces does 1 pt. weigh? 1 qt.? 1 gi.?

4. A common-sized tumbler holds $\frac{1}{2}$ pt. of water. How many such tumblers to a quart? How many gills to a tumbler?

ORAL EXERCISE

1. How many seconds make a minute?
2. How many minutes make an hour?
3. Close your eyes, and raise your hand when you think one minute has passed.
4. How many hours make a day? (This means a day and night together.)
5. Tell the names of the months that have thirty days each. Of the others, name one that does not have thirty-one days.
6. Do you know how many days there are in a year? Every four years there is a leap year. How many days then?

You have learned (page 63) the table of time, except the following:

365 days = 1 year (yr.), except the leap year.

30 or 31 days = 1 month (mo.), except February.

12 months = 1 year.

In leap years February has 29 days, and the year has 366 days.

WRITTEN EXERCISE

1. How many hours do you spend in school every day? How many minutes is this?
2. How many hours do you spend in school every week? every 4 wk.? every 36 wk.?
3. There are 5 school days in a week and 36 school weeks in a year. How many school days are there in a year?

ORAL EXERCISE

1. If you were to measure the length of your state, would you measure by miles or by feet?
2. If you were to measure your schoolroom, would you measure by miles, or by feet, or by inches?
3. If you were to measure your finger, would you measure by yards, or by feet, or by inches?
4. If asked your age, would you answer in years or in weeks? If asked how long before you would go home to-day, how would you answer?

When we measure anything by feet we call the foot the *unit of measure*. So if we measure weight by the pound, the pound is the unit of measure.

In measuring great lengths we use the mile as the unit. For lengths less than 1 mi. we often use yards or feet. For small distances we often use the inch. For time we use the second, minute, hour, week, and so on.

MEASURING

1. Measure the length of the room, using as the unit 1 ft.; also 1 yd.
2. Measure the length of the desk, using as the unit 1 ft.; also 1 in.
3. Measure the height of the desk, using as the unit 1 ft.; also 1 in.
4. Imagine a square 36 in. on a side. Measure its area, using 1 sq. ft. as the unit; also using 1 sq. yd. Draw a picture on a scale of 1 in. to 1 ft.

ORAL EXERCISE

Tell the answers rapidly :

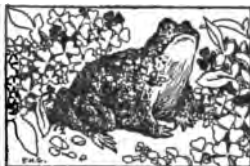
- | | |
|--|--|
| 1. $241 + 102$. | 2. $\$241 + \201 . |
| 3. $120 \text{ ft.} + 220 \text{ ft.}$ | 4. $125 \text{ mi.} + 75 \text{ mi.}$ |
| 5. $\$450 - \150 . | 6. $47\frac{1}{2} \text{ bu.} - \frac{1}{2} \text{ bu.}$ |
| 7. $48\frac{3}{4} \text{ bu.} - \frac{1}{2} \text{ bu.}$ | 8. $10\frac{1}{2} \text{ sq. ft.} - \frac{1}{4} \text{ sq. ft.}$ |
| 9. 9 times 800 ft. | 10. 9 times 71 mi. |
| 11. 8 times $\$21$. | 12. 5 times $\$200$. |
| 13. $72 \text{ ft.} \div 8$. | 14. $\$250 \div 5$. |
| 15. $\$40 \div 8$. | 16. $350 \text{ ft.} \div 7$. |
| 17. $819 \text{ ft.} \div 9$. | 18. $\frac{1}{8}$ of 488 yd. |

WRITTEN EXERCISE

The toad is one of man's best friends. One toad will keep a garden of 800 sq. ft. free from harmful insects.

1. At this rate, how many toads would protect from insects a garden 80 ft. wide and 100 ft. long?

2. The eggs of 4 toads were counted and found to be 7547, 11,540, 7927, and 9536. How many were there in all?



3. If one out of 50 hatched, how many hatched? (Divide all by 50.) If 715 of these were destroyed by other animals, how many survived?

4. If each of these survivors destroys insects that would cause $\$10$ worth of damage, how much are they all worth to a village?

WRITTEN EXERCISE

Add:

- | | | | |
|------------|------------|-------------|--------------|
| 1. 2634 | 2. 804 | 3. \$82.75 | 4. \$91.75 |
| 296 | 1427 | 31.42 | 66.73 |
| 1472 | 3600 | 68.93 | 8.49 |
| 2108 | 584 | 4.67 | 4.81 |
| <u>436</u> | <u>796</u> | <u>5.21</u> | <u>16.00</u> |

Subtract:

- | | | |
|---------------|--------------|--------------|
| 5. \$632.48 | 6. \$832.49 | 7. \$293.50 |
| <u>429.53</u> | <u>59.81</u> | <u>67.98</u> |

Multiply:

8. 743 by 26. 9. 674 by 57. 10. 248 by 83.

Divide:

11. 1728 by 12. 12. 832 by 32. 13. 5125 by 41.

Add:

- | | | | |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 14. $27\frac{4}{5}$ | 15. $16\frac{1}{2}$ | 16. $21\frac{3}{4}$ | 17. $23\frac{1}{2}$ |
| <u>$13\frac{1}{5}$</u> | <u>$17\frac{1}{4}$</u> | <u>$49\frac{1}{2}$</u> | <u>$19\frac{3}{4}$</u> |

Subtract:

- | | | | |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 18. $35\frac{3}{4}$ | 19. $42\frac{1}{2}$ | 20. $31\frac{3}{4}$ | 21. $91\frac{5}{8}$ |
| <u>$12\frac{1}{2}$</u> | <u>$16\frac{1}{4}$</u> | <u>$12\frac{1}{4}$</u> | <u>$67\frac{1}{8}$</u> |

22. Find $\frac{1}{2}$ of 720; also $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{4}$, and $\frac{3}{4}$ of 720.

23. Find $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{1}{6}$, and $\frac{5}{6}$ of 1440.

24. Find $\frac{2}{3}$ of 165, 222, 471, 522.

25. Find $\frac{4}{5}$ of 275, 340, 785, 4600.

26. Find $\frac{3}{4}$ of 640, 760, 112, 3240.

27. Find $\frac{2}{3}$ of 420, 675, 825, 4305.

CHAPTER IV

I. NUMBERS TO 100,000. SPECIAL ATTENTION TO MULTIPLICATION AND DIVISION

COUNTING REVIEWED

ORAL EXERCISE

1. Count by 2's from 2 to 24. Give the multiplication table of 2's to 12 times 2.

2. Count by 3's from 3 to 36. Give the multiplication table of 3's to 12 times 3.

3. In the same way count by

4's to 48,	giving the multiplication table to 12 times 4 ;
5's to 60,	" " " " " " 5 ;
6's to 72,	" " " " " " 6 ;
7's to 84,	" " " " " " 7 ;
8's to 96,	" " " " " " 8 ;
9's to 108,	" " " " " " 9 ;
10's to 120,	" " " " " " 10 ;
11's to 132,	" " " " " " 11 ;
12's to 144,	" " " " " " 12.

WRITTEN EXERCISE

Write the multiplication table from 1×1 to 12×12 .

ORAL EXERCISE

1. Count by 10's from 10 to 100.
2. Count by 100's from 100 to 1000.
3. Count by 1000's from 1000 to 10,000.
4. Count by 10,000's from 10,000 to 100,000.

In the number 23,546 a comma (,), sometimes called a *separatrix* when used like this, is written between the thousands and hundreds. This makes it easier to read the number.

In the number 23,546

the 6 occupies units' place,

“ 4 “ tens' place,

“ 5 “ hundreds' place,

“ 3 “ thousands' place,

“ 2 “ ten thousands' place,

and in the number 100,000, the 1 occupies hundred thousands' place.

WRITTEN EXERCISE

1. Write the numbers: forty thousand, four hundred four; seventy thousand, seven hundred forty-seven; sixty-four thousand, seven hundred eighty-eight; ninety-eight thousand, seven hundred sixty-five; fifty thousand, five; sixty-six thousand, six hundred sixty-six; ten thousand, ten.

2. Write in words the numbers: 1234; 12,345; 34,567; 45,678; 56,789.

3. Write in words the numbers: 64,742; 73,498; 60,006; 75,075; 12,345; 92,846; 10,001.

UNITED STATES MONEY

ORAL EXERCISE

Read the amounts in Exs. 1-9:

- | | | |
|-------------|---------------|-----------------|
| 1. \$4.75. | 2. \$26.50. | 3. \$92.05. |
| 4. \$10.10. | 5. \$0.62½. | 6. \$2.12½. |
| 7. \$3.33⅓. | 8. \$3475.75. | 9. \$11,245.50. |

The teacher should write all the numbers in Exs. 10-18 on the blackboard, or refer to the book.

Add the numbers in Exs. 10-15:

- | | | |
|-------------------------------|-------------------------------|------------------------------|
| 10. \$250.25
<u>325.10</u> | 11. \$475.15
<u>102.12</u> | 12. \$275.62
<u>23.00</u> |
| 13. \$407.75
<u>92.00</u> | 14. \$0.75
<u>0.13</u> | 15. \$0.25
<u>32.75</u> |

Subtract the numbers in Exs. 16-18:

- | | | |
|-------------------------------|-------------------------------|-------------------------------|
| 16. \$425.75
<u>110.25</u> | 17. \$350.50
<u>120.00</u> | 18. \$825.50
<u>125.25</u> |
|-------------------------------|-------------------------------|-------------------------------|

WRITTEN EXERCISE

Multiply in Exs. 1-4:

- | | | | |
|-----------------------|-----------------------|-----------------------|------------------------|
| 1. \$233
<u>32</u> | 2. \$322
<u>43</u> | 3. \$505
<u>64</u> | 4. \$1601
<u>19</u> |
|-----------------------|-----------------------|-----------------------|------------------------|

Divide the following:

- | | | |
|-----------------|-----------------|------------------|
| 5. \$9676 ÷ 41. | 6. \$9288 ÷ 72. | 7. \$9936 ÷ 92. |
| 8. \$7128 ÷ 81. | 9. \$9579 ÷ 31. | 10. \$8569 ÷ 41. |

ADDITION

ORAL EXERCISE

Add:

1.	20	28	28	28	38	48
	<u>30</u>	<u>30</u>	<u>5</u>	<u>35</u>	<u>35</u>	<u>35</u>

2.	40	44	44	44	45	45
	<u>60</u>	<u>60</u>	<u>7</u>	<u>67</u>	<u>67</u>	<u>69</u>

3.	70	73	73	73	74	74
	<u>90</u>	<u>90</u>	<u>8</u>	<u>98</u>	<u>98</u>	<u>99</u>

You see from the above examples that it is not difficult to add at sight two numbers of two figures each. 67
 Thus, add 67 and 58, and say: "58, 65 (that is, 58
 58 + 7), 125 (that is, 65 + 60, because 6 + 6 = 12)." 125

4.	97	73	81	73	66	75
	<u>68</u>	<u>49</u>	<u>96</u>	<u>37</u>	<u>48</u>	<u>89</u>

5. Add, if possible without writing the numbers:

147	246	349	683	532	829
<u>32</u>	<u>64</u>	<u>72</u>	<u>48</u>	<u>96</u>	<u>53</u>

6. If you buy 38 ct. worth of cloth and 23 ct. worth of ribbon, how much do you pay?

7. If you weigh 53 lb. and Cora weighs 48 lb., how much do you both weigh?

8. If a farmer buys one cow for \$38 and another for \$43, how much do both cost?

WRITTEN EXERCISE

The pupils should add rapidly from the lowest number upwards, and check by adding from the top downwards. They should see how many of the following they can add and check in five minutes, taking them in order.

1.	2.	3.	4.	5.
\$482.75	\$181.23	\$822.72	\$32.98	\$909.92
122.30	62.49	406.91	149.72	98.00
42.65	426.32	329.92	683.09	6.49
308.70	43.71	67.42	9.89	.93

6.	7.	8.	9.	10.
\$498.92	\$32.99	\$234.27	\$0.35	\$298.38
92.68	841.00	26.42	21.62	23.42
34.41	0.68	982.00	342.71	671.82
9.00	32.97	4.39	459.00	84.96

11.	12.	13.	14.	15.
\$293.48	\$429.30	\$298.75	\$293.49	\$674.00
64.79	62.41	92.30	98.71	82.96
392.60	67.92	68.70	634.00	3.09
34.48	38.00	491.63	82.98	842.00
27.62	526.00	90.89	99.81	891.75

16.	17.	18.	19.	20.
\$342.42	\$426.26	\$329.30	\$298.75	\$129.30
27.92	290.30	49.30	32.78	472.63
31.82	320.30	67.29	62.96	87.96
61.49	42.87	9.37	34.21	54.98
827.30	67.42	402.72	293.48	209.00

SUBTRACTION

ORAL EXERCISE

- | | | | | |
|---------------|---|--|---|---|
| 1. Subtract : | $\begin{array}{r} 95 \\ \underline{60} \end{array}$ | $\begin{array}{r} 95 \\ \underline{6} \end{array}$ | $\begin{array}{r} 95 \\ \underline{66} \end{array}$ | $\begin{array}{r} 95 \\ \underline{86} \end{array}$ |
| 2. Subtract : | $\begin{array}{r} 82 \\ \underline{30} \end{array}$ | $\begin{array}{r} 82 \\ \underline{7} \end{array}$ | $\begin{array}{r} 82 \\ \underline{37} \end{array}$ | $\begin{array}{r} 82 \\ \underline{47} \end{array}$ |
| 3. Subtract : | $\begin{array}{r} 46 \\ \underline{20} \end{array}$ | $\begin{array}{r} 46 \\ \underline{9} \end{array}$ | $\begin{array}{r} 46 \\ \underline{29} \end{array}$ | $\begin{array}{r} 46 \\ \underline{27} \end{array}$ |

You see from the above examples that it is not difficult to subtract one number of two figures from 46 another one. Thus, to subtract 29 from 46, find $\begin{array}{r} 29 \\ \underline{17} \end{array}$ $46 - 9 = 37$, and $37 - 20 = 17$.

- | | | | | |
|---------------|---|---|---|---|
| 4. Subtract : | $\begin{array}{r} 52 \\ \underline{36} \end{array}$ | $\begin{array}{r} 73 \\ \underline{48} \end{array}$ | $\begin{array}{r} 67 \\ \underline{39} \end{array}$ | $\begin{array}{r} 81 \\ \underline{35} \end{array}$ |
|---------------|---|---|---|---|

5. From 52 subtract 15; from the result subtract 19.

6. If you buy 33 ct. worth of groceries and give the grocer half a dollar, how much change should you receive?

7. If you buy 40 ct. worth of candy and 18 ct. worth of cookies, how much change should you receive for 75 ct.?

8. If you buy 90 ct. worth of meat and 37 ct. worth of fish, and give the dealer \$1.50, how much change should you receive?

WRITTEN EXERCISE

See how long it takes you to perform these subtractions. You should have no mistakes when you finish the work, because you should check each result.

1.	2.	3.	4.	5.
\$281.42	\$691.75	\$298.30	\$427.20	\$532.60
<u>135.02</u>	<u>208.02</u>	<u>107.60</u>	<u>109.32</u>	<u>237.62</u>

6.	7.	8.	9.	10.
\$532.65	\$281.92	\$409.72	\$672.35	\$491.63
<u>206.39</u>	<u>192.60</u>	<u>286.58</u>	<u>148.39</u>	<u>269.75</u>

11.	12.	13.	14.	15.
\$426.32	\$298.91	\$427.32	\$681.48	\$429.39
<u>126.49</u>	<u>129.92</u>	<u>334.48</u>	<u>496.12</u>	<u>330.26</u>

16.	17.	18.	19.	20.
\$929.32	\$807.21	\$600.00	\$505.02	\$829.09
<u>830.40</u>	<u>720.32</u>	<u>48.75</u>	<u>60.80</u>	<u>298.90</u>

21.	22.	23.	24.	25.
\$400.00	\$209.00	\$300.40	\$402.70	\$620.02
<u>39.75</u>	<u>60.40</u>	<u>29.09</u>	<u>80.79</u>	<u>69.91</u>

26.	27.	28.	29.	30.
\$800.25	\$402.33	\$627.03	\$481.02	\$302.04
<u>549.25</u>	<u>60.48</u>	<u>39.72</u>	<u>99.80</u>	<u>40.60</u>

31.	32.	33.	34.	35.
\$127.49	\$292.08	\$600.05	\$481.27	\$926.30
<u>49.89</u>	<u>98.75</u>	<u>62.70</u>	<u>90.39</u>	<u>48.75</u>

WRITTEN EXERCISE

1. I know a village in which there are 2473 men, 2587 women, and 3575 boys and girls. How many are there in all?

2. In one school in the village there are 127 girls, and the number of boys is 19 less. How many pupils are there in the school?

3. The school ground is 100 ft. along the street and 165 ft. deep. The trustees wish to put a new fence around the lot. How many feet of fence are needed?

4. After school on Monday one of the boys sold 32 papers, and during the next five days he sold 27, 19, 31, 41, and 23. How many did he sell during the week?

5. If the attendance at the school this year is 235, and if it was 27 less last year, and 19 less than that the year before, how much was it year before last?

6. The expenses of the school this year are as follows: teachers, \$2325; fuel, \$297.45; janitor, \$425; insurance, \$32; books, maps, and supplies, \$355.70; repairs, \$81.55; shrubbery for the grounds, \$23.75. How much were the total expenses?

7. Last year the expenses of the school were \$263.20 less than this year. How much were they then?

MULTIPLICATION

ORAL EXERCISE

• The tables should be reviewed continually, not only as tables, but more frequently by asking for various products, as 6×7 , 9×3 , and 4×8 .

1. Multiply 7 by 2, 10 by 2, 17 by 2, 18 by 2, 19 by 2.

2. Multiply 6 by 3, 10 by 3, 16 by 3, 15 by 3, 14 by 3.

3. Multiply 12 by 4, 12 by 3, 11 by 4, 11 by 3, 12 by 2.

4. State two numbers which multiplied together make 50; 49; 48; 46; 45; 44; 42; 39; 38; 36; 35; 34; 33; 32.

5. State all the pairs of numbers which multiplied together make 50; 45; 44; 36.

WRITTEN EXERCISE

1. If $\frac{1}{4}$ of a yard of silk costs 19 ct., what will 1 yd. cost at the same rate?

2. If $\frac{3}{4}$ of a yard of velvet costs 72 ct., what will $\frac{1}{4}$ yd. cost? $\frac{1}{2}$ yd., or 1 yd.?

3. If $\frac{1}{2}$ of a yard of ribbon costs 64 ct., what will $\frac{1}{4}$ yd. cost? Then what will 1 yd. cost?

4. If $\frac{3}{4}$ of a yard of furniture tapestry costs \$1.95, what is the rate per yard?

5. If 35 yd. of silk velvet costs \$70, how much will 12 yd. cost?

WRITTEN EXERCISE.

In these examples in multiplication see how large a score you can make in five minutes, counting every correct result 1, and subtracting 2 for every incorrect result.

- | | | | |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1. \$293.50
5
<u> </u> | 2. \$482.60
7
<u> </u> | 3. \$981.75
6
<u> </u> | 4. \$371.72
8
<u> </u> |
| 5. \$309.72
9
<u> </u> | 6. \$402.03
12
<u> </u> | 7. \$625.72
11
<u> </u> | 8. \$829.30
13
<u> </u> |
| 9. \$575.25
15
<u> </u> | 10. \$609.72
18
<u> </u> | 11. \$572.30
21
<u> </u> | 12. \$986.75
25
<u> </u> |
| 13. \$421.30
23
<u> </u> | 14. \$531.92
32
<u> </u> | 15. \$683.40
35
<u> </u> | 16. \$532.20
45
<u> </u> |
| 17. \$681.40
52
<u> </u> | 18. \$700.09
41
<u> </u> | 19. \$682.02
53
<u> </u> | 20. \$409.60
55
<u> </u> |

You have learned how to multiply by a two-figure number. It is nearly as easy to multiply by a three-figure number. For example, multiply 348 by 234.

This shows the full work:

$$\begin{array}{r}
 348 \\
 234 \\
 \hline
 1392 \text{ product by } 4 \\
 10440 \text{ " " } 30 \\
 69600 \text{ " " } 200 \\
 81432 \text{ " " } 234
 \end{array}$$

But we write only this:

$$\begin{array}{r}
 348 \\
 234 \\
 \hline
 1392 \\
 1044 \\
 696 \\
 \hline
 81432
 \end{array}$$

WRITTEN EXERCISE

Multiply :

- | | | | |
|---|---|---|---|
| 1. $\begin{array}{r} \$340 \\ 175 \\ \hline \end{array}$ | 2. $\begin{array}{r} \$409 \\ 243 \\ \hline \end{array}$ | 3. $\begin{array}{r} \$629 \\ 121 \\ \hline \end{array}$ | 4. $\begin{array}{r} \$4987 \\ 46 \\ \hline \end{array}$ |
| 5. $\begin{array}{r} \$61.72 \\ 54 \\ \hline \end{array}$ | 6. $\begin{array}{r} 428 \\ 231 \\ \hline \end{array}$ | 7. $\begin{array}{r} 329 \\ 246 \\ \hline \end{array}$ | 8. $\begin{array}{r} \$14.75 \\ 125 \\ \hline \end{array}$ |
| 9. $\begin{array}{r} \$527.30 \\ 64 \\ \hline \end{array}$ | 10. $\begin{array}{r} \$426.30 \\ 68 \\ \hline \end{array}$ | 11. $\begin{array}{r} \$462.75 \\ 39 \\ \hline \end{array}$ | 12. $\begin{array}{r} \$329.82 \\ 98 \\ \hline \end{array}$ |
| 13. $\begin{array}{r} \$472.96 \\ 89 \\ \hline \end{array}$ | 14. $\begin{array}{r} \$309.87 \\ 72 \\ \hline \end{array}$ | 15. $\begin{array}{r} \$481.20 \\ 64 \\ \hline \end{array}$ | 16. $\begin{array}{r} \$502.75 \\ 69 \\ \hline \end{array}$ |
| 17. $\begin{array}{r} \$681.39 \\ 72 \\ \hline \end{array}$ | 18. $\begin{array}{r} \$17.42 \\ 146 \\ \hline \end{array}$ | 19. $\begin{array}{r} \$21.50 \\ 371 \\ \hline \end{array}$ | 20. $\begin{array}{r} \$491.76 \\ 81 \\ \hline \end{array}$ |

21. At \$85 an acre, how much are 164 acres of land worth?

22. At \$37.50 a head, how much are 38 head of cattle worth?

23. At \$36 a dozen for milk cans, how much will a farmer have to pay for 14 cans?

24. If the school buys 15 dictionaries at \$6.75 each, how much will it pay for all?

25. If a dealer pays \$3.84 for a dozen arithmetics, how much will 144 cost?

26. A man buys 4 head of cattle for \$168, and adds them to his dairy. He then sells off 13 at this same price apiece. What does he receive?

DIVISION

You have learned how to divide by numbers of one figure, and by two-figure numbers ending in 0, 1, or 2. We will now divide by other two-figure numbers. For example, divide 2701 by 73.

We see that $2000 \div 73 = \text{no thousands}$, $2700 \div 73 = \text{no hundreds}$, but $2700 \div 73 = 3 \text{ tens}$, with 511 still to be divided. We then see that $511 \div 73 = 7$. Therefore, the quotient is 37.

$$\begin{array}{r} 37 \\ 73 \overline{)2701} \\ \underline{219} \\ 511 \\ \underline{511} \\ 0 \end{array}$$

A satisfactory understanding of a process like this comes only from blackboard work before the class, followed by plenty of drill.

To check the result, we have found that the quotient multiplied by the divisor equals the dividend. Here, 73 times 37 equals 2701.

WRITTEN EXERCISE

1. $725 \div 25$. 2. $5143 \div 37$. 3. $9990 \div 45$.
4. $3219 \div 29$. 5. $3465 \div 35$. 6. $3108 \div 14$.
7. If a farmer pays \$1935 for 43 head of cattle, how much does he pay a head?
8. An agent sells 23 sewing machines for \$483. How much does he receive on an average for each?
9. The school attendance for 23 days in our room was 805. What was the average daily attendance?
10. A city dealer bought 25 children's bicycles for \$275. How much did they cost apiece?

Required to divide \$198.32 by 74.

This shows the full work: But we write only this:

$ \begin{array}{r} \$2.68 \\ 74 \overline{) \$198.32} \\ \underline{148} \quad = 74 \text{ times } \$2 \\ 50.32 \text{ still to be divided} \\ \underline{44.40} = 74 \text{ times } \$0.60 \\ 5.92 \text{ still to be divided} \\ \underline{5.92} = 74 \text{ times } \$0.08 \end{array} $	$ \begin{array}{r} \$2.68 \\ 74 \overline{) \$198.32} \\ \underline{148} \\ 503 \\ \underline{444} \\ 592 \\ \underline{592} \end{array} $
--	--

Because 74 is not contained in 1, $\$100 \div 74 =$ no hundreds of dollars. Because 74 is not contained in 19, $\$190 \div 74 =$ no tens of dollars. Because $19 \div 7 =$ more than 2 but less than 3, we see that $\$198 \div 74 = \2 , with $\$50.32$ still to be divided. $\$50.32 \div 74 = \0.60 , with $\$5.92$ still to be divided. $\$5.92 \div 74 = \0.08 . Therefore, the quotient is \$2.68.

WRITTEN EXERCISE

1. $\$181.44 \div 56$.
2. $\$110.45 \div 47$.
3. $\$188.79 \div 87$.
4. $\$85.47 \div 77$.
5. $\$1602.54 \div 58$.
6. $\$160.16 \div 44$.
7. A dealer paid \$32.40 for 2 doz. sleds. How much did they cost apiece?
8. A clothing dealer paid \$230.40 for 32 boys' suits. How much did he pay per suit?
9. A merchant paid \$34.56 for 4 doz. boys' hats. How much did they cost apiece?
10. If 6 doz. dolls cost a dealer \$27.36, how much did they cost apiece?

ORAL EXERCISE

1. We say that $21 \div 4 = 5$, and 1 remainder; or that $21 \div 4 = 5\frac{1}{4}$. In what two ways can you express the result of dividing 29 by 6?

2. In the same way, give the results of

$$35 \div 8, 45 \div 6, 81 \div 8, 74 \div 9, 48 \div 5, 60 \div 8.$$

3. Show from this line that $\frac{2}{12} = \frac{1}{6}$, and that $\frac{8}{12} = \frac{2}{3}$.

4. To what simpler fractions are $\frac{4}{12}$, $\frac{6}{12}$, $\frac{8}{12}$, $\frac{9}{12}$, and $\frac{10}{12}$ equal?

5. Show from this line that $\frac{2}{10} = \frac{1}{5}$. To what simpler fractions are $\frac{4}{10}$, $\frac{6}{10}$, $\frac{8}{10}$, and $\frac{9}{10}$ equal?

6. Divide: $10 \overline{)70 + 5}$ $10 \overline{)85}$ $12 \overline{)60 + 6}$ $12 \overline{)64}$

You have seen (page 124) that we may have remainders, and that these give fractions in the quotients.

For example, $68 \div 12 = 5\frac{8}{12} = 5\frac{2}{3}$. $12 \overline{)68}$
 $5\frac{2}{3}$

WRITTEN EXERCISE

- | | | |
|--------------------------|--------------------------|--------------------------|
| 1. $90 \div 12$. | 2. $70 \div 12$. | 3. $89 \div 12$. |
| 4. $100 \div 12$. | 5. $114 \div 12$. | 6. $126 \div 12$. |
| 7. $150 \div 12$. | 8. $180 \div 12$. | 9. $455 \div 10$. |
| 10. $672 \div 10$. | 11. $938 \div 10$. | 12. $895 \div 10$. |
| 13. $723 \div 11$. | 14. $429 \div 11$. | 15. $892 \div 11$. |
| 16. $741 \div 11$. | 17. $\$25.26 \div 12$. | 18. $\$42.66 \div 12$. |
| 19. $\$58.11 \div 12$. | 20. $\$39.64 \div 12$. | 21. $\$342.70 \div 12$. |
| 22. $\$606.06 \div 12$. | 23. $\$493.30 \div 12$. | 24. $\$829.24 \div 12$. |

In the division of 34,943 by 82, the first dividend used is 349 (hundreds). It

	426 $\frac{11}{82}$	
is called the <i>first partial dividend</i> .	82 $\overline{)34943}$	349 = first partial dividend
	32800	
The second dividend used is	214	= second partial dividend
214 (tens). It is called	164	
the <i>second partial dividend</i> .	503	= third partial dividend
	492	
	11	remainder

503 is the *third partial dividend*.

The first figure in the quotient, 4, was found by seeing that $34 \div 8 = \text{nearly } 4$.

This operation in which the partial dividends are written out is called *long division*.

When the partial dividends are not written out, the operation is called *short division*.

You have found (page 148) that 0 may be a figure in the quotient. This does not change the work, as you will see in this case of $12,464 \div 41$.

To check the result, $41 \times 304 = 12,464$.

$$\begin{array}{r} 6 \overline{)246} \\ 41 \\ \hline 304 \\ 41 \overline{)12464} \\ 123 \\ \hline 164 \\ \hline 164 \end{array}$$

WRITTEN EXERCISE

1. $2121 \div 21$. 2. $5304 \div 52$. 3. $10,556 \div 52$.
4. $8526 \div 42$. 5. $6510 \div 62$. 6. $72,981 \div 81$.
7. $2464 \div 61$. 8. $7536 \div 71$. 9. $19,099 \div 21$.
10. $8362 \div 92$. 11. $9384 \div 92$. 12. $73,895 \div 82$.
13. A dealer sends to the publisher an order for 41 arithmetics. The bill is \$12.71. How much does each book cost?

ORAL EXERCISE

1. Divide: $12 \overline{)1200 + 120 + 12}$, which is the same as $12 \overline{)1332}$.

2. Divide: $11 \overline{)1100 + 440 + 77}$, which is the same as $11 \overline{)1617}$.

Teachers who find classes prepared for using short division in dividing by 11 and 12 may use the following.

While you have learned how to divide by 11 and by 12 by long division, you see that you can use short division, as in the case of $12 \overline{)8917}$
 $8917 \div 12$. $743 \frac{1}{12}$

You may think: "I do not know the quotient of $8917 \div 12$, but I know that $8400 \div 12 = 700$, leaving 517 to be divided. I do not know the quotient of $517 \div 12$, but I know that $480 \div 12 = 40$, leaving 37 to be divided. $37 \div 12 = 3 \frac{1}{12}$. Therefore, the quotient is $743 \frac{1}{12}$."

In dividing by 2, 3, 4, and so on to 12, you should use short division.

WRITTEN EXERCISE

1. $2223 \div 11$. 2. $1608 \div 11$. 3. $1224 \div 12$.

4. $2473 \div 12$. 5. $7295 \div 12$. 6. $1617 \div 11$.

7. At \$42.00 a dozen, how much will a school desk like yours cost? How much will 8 cost?

8. At \$186 a dozen suits, how much will a dealer have to pay per suit for clothing?

9. At \$90 a dozen, how much must a jeweler pay for 3 clocks?

ORAL EXERCISE

1. Divide: $400 \div 10$, $\$4 \div 10$.
2. Divide: $60 \div 20$, $60 \div 30$, $600 \div 30$.
3. Divide: $900 \div 30$, $9000 \div 30$, $900 \text{ ct.} \div 30$, $\$9 \div 30$.
4. What is the short way of dividing a number that ends in 0 by 10? by 20? by 30? by 40?
5. By what fraction do you indicate $\frac{1}{5}$ of 2? of 4? of 6? $\frac{1}{5}$ of 8 = $1\frac{2}{5}$?
6. $75 \div 10 = 7\frac{2}{10} = 7\frac{1}{5}$? $85 \div 10$ equals how many?

You have found (page 144) that there is a short way of dividing by 10 or by any number of 10's.

$$\begin{array}{r} 1\cancel{0}\overline{)726\cancel{0}} \\ 726 \end{array}$$

$$\begin{array}{r} 2\cancel{0}\overline{)726\cancel{0}} \\ 363 \end{array}$$

$$\begin{array}{r} 3\cancel{0}\overline{)726\cancel{0}} \\ 242\frac{1}{3} \end{array}$$

If the dividend does not end in 0, you found by Ex. 6, above, that you could still use this short way. For example, divide 7267 by 10, 20, and 30.

$$\begin{array}{r} 1\cancel{0}\overline{)726\cancel{7}} \\ 726\frac{7}{10} \end{array}$$

$$\begin{array}{r} 2\cancel{0}\overline{)726\cancel{7}} \\ 363\frac{7}{10} \end{array}$$

$$\begin{array}{r} 3\cancel{0}\overline{)726\cancel{7}} \\ 242\frac{7}{10} \end{array}$$

WRITTEN EXERCISE

Divide, using short division:

1. $1720 \div 20$. 2. $\$2350 \div 20$. 3. $52,350 \div 50$.
4. $31,200 \div 30$. 5. $23,240 \div 20$. 6. $21,350 \div 50$.
7. $405,370 \div 90$. 8. $124,810 \div 80$. 9. $100,100 \div 70$.
10. $314,610 \div 30$. 11. $124,360 \div 40$. 12. $402,360 \div 60$.
13. $\$48.27 \div 4$. 14. $\$29.63 \div 2$. 15. $\$35.73 \div 4$.
16. $\$217.63 \div 5$. 17. $\$402.01 \div 5$. 18. $\$222.22 \div 8$.

In much the same way as on page 185, we may divide by three-figure numbers. For example, divide 12,525 by 501.

This shows the full work: But we write only this:

$\begin{array}{r} 25 \\ 501 \overline{)12525} \\ \underline{10020} = 501 \times 20 \\ 2505 \text{ still to be divided} \\ \underline{2505} = 501 \times 5 \end{array}$	$\begin{array}{r} 25 \\ 501 \overline{)12525} \\ \underline{1002} \\ 2505 \\ \underline{2505} \end{array}$
--	--

Since the product of 25 and 501 is 12,525, the work is right.

WRITTEN EXERCISE

1. $\$8687 \div \512 .
2. $\$249.83 \div 301$.
3. $\$33,732 \div 912$.
4. $\$397.39 \div 811$.
5. $\$511.11 \div 631$.
6. $\$2269.47 \div 707$.
7. $\$467.25 \div 623$.
8. $47,595 \text{ ft.} \div 501 \text{ ft.}$
9. A man bought 211 sheep for \$1529.75. How much was this a head?
10. He sold these sheep for \$1550.85. How much did he receive a head?
11. With the money received from the sheep he purchased cattle at \$31 a head. How many could he buy, and how much had he left after buying as many as he could?
12. If he had taken the \$1550.85 and bought 15 horses, how much would have been the average price?
13. If he had taken \$1032.75 of his money, and with it bought 153 sheep, how much would he have paid a head?

Sometimes a mistake is made in making the quotient figure too large. For example, divide 4375 by 175.

Because $4 \div 1 = 4$, it might at first be thought that $437 \div 175 = \text{nearly } 4$. But this cannot be right, for 175 is nearly 200, and $437 \div 200$ is only a little over 2.

$$\begin{array}{r} 25 \\ 175 \overline{)4375} \\ \underline{350} \\ 875 \end{array}$$

If the quotient is taken too large, the partial product will be greater than the dividend.

If the quotient is taken too small, the remainder will be greater than the divisor.

WRITTEN EXERCISE

1. $\$971.25 \div 111$.
2. $\$1611.42 \div 321$.
3. $\$10,593 \div 107$.
4. $\$343.68 \div 537$.
5. $\$139.30 \div 870$.
6. $\$961.88 \div 346$.
7. $\$173.13 \div 199$.
8. $\$321.30 \div 306$.
9. $\$142.74 \div 234$.
10. $\$97.01 \div 109$.
11. $\$223.11 \div 111$.
12. $\$1406.25 \div 225$.
13. If 98 machines cost $\$3456.46$, what is the cost of each?
14. If 175 tons of hay cost $\$1837.50$, what is the cost per ton?
15. If 121 yd. of carpet cost $\$78.65$, how much does it cost per yard?
16. A cement walk 81 ft. long and 5 ft. wide cost $\$141.75$. How much did it cost per square foot?
17. A carpet dealer has on hand 221 yd. of carpet that cost him $\$106.08$. At this rate, how much did 53 yd. cost him?

FRACTIONS

ORAL EXERCISE

1. First think $\frac{1}{3}$ of each of these numbers, and then state $\frac{2}{3}$ of each: 9, 6, 12, 3, 21, 30.
2. First think $\frac{1}{4}$ of each of these numbers, and then state $\frac{3}{4}$ of each: 32, 40, 12, 24, 20, 28.
3. First think $\frac{1}{6}$ of each of these numbers, and then state $\frac{2}{6}$, or $\frac{3}{6}$, or $\frac{4}{6}$ of each, as the teacher directs: 20, 45, 30, 5, 50, 15, 40, 25, 10, 35.
4. Think $\frac{1}{8}$ of each of these numbers, and then state $\frac{3}{8}$ of each: 48, 24, 36, 42, 18, 12, 36, 54, 60.
5. Think $\frac{1}{8}$ of each of these numbers, and then state $\frac{3}{8}$, or $\frac{5}{8}$, or $\frac{7}{8}$, of each, as the teacher directs: 64, 32, 24, 16, 40, 8, 72, 48, 56, 80.
6. State rapidly $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, of 12; also of 24; also of 36.

WRITTEN EXERCISE

1. From $\frac{5}{8}$ of 712 subtract $\frac{3}{8}$ of 928.
2. From $\frac{7}{8}$ of 576 subtract $\frac{2}{8}$ of 216.
3. Add $\frac{1}{4}$ of 288, $\frac{2}{8}$ of 288, and $\frac{5}{8}$ of 714.
4. Add $\frac{1}{2}$ of 1104, $\frac{2}{8}$ of 1104, and $\frac{7}{8}$ of 1104.
5. Add $\frac{1}{4}$ of \$29.64, $\frac{1}{8}$ of \$73.80, $\frac{1}{6}$ of \$174.48, and $\frac{1}{8}$ of \$203.60.
6. How much more is $\frac{1}{3}$ of \$2640 than $\frac{1}{4}$ of the same amount?
7. How much less is $\frac{1}{6}$ of \$26.40 than $\frac{1}{8}$ of the same amount?

ORAL EXERCISE

1. A farmer has 25 sheep in one lot, 25 in another, and 10 in a third. How many has he?



2. He expects 9 lb. of wool from each in the spring. How many pounds will he have in all?
3. If half of the flock of sheep are worth \$6 a head, what is the value of this half?

WRITTEN EXERCISE

1. One quarter of the flock cost him \$6.20 a head. How much did he pay for this lot?
2. If half of his sheep cost \$6 a head, a quarter \$5 a head, and the rest of them \$6.20 a head, how much did they all cost?
3. Taking this total cost, and knowing that there were 60 in all, find the average price per head.
4. He averaged $9\frac{1}{4}$ lb. of wool from each sheep, and sold it for 44 ct. a pound. What was the wool of the 60 sheep worth at this rate?
5. If it cost this farmer 40 ct. a hundred pounds to get the wool to market, how much did it cost to get all of the wool there?

ORAL EXERCISE

1. How much is $\frac{1}{2}$ of 24? $\frac{1}{3}$ of 30? their sum?
2. How much is $\frac{1}{2}$ of 20? $\frac{1}{4}$ of 24? their sum?
3. How much is $\frac{1}{2}$ of 30, minus $\frac{1}{2}$ of 16?
4. How much is $\frac{1}{6}$ of 30, minus $\frac{1}{6}$ of 20?



5. How many halves in 1? in $1\frac{1}{2}$? in 2? Express $\frac{3}{2}$ as a whole number and a fraction. Express $\frac{4}{2}$ as a whole number.



6. How many thirds in 1? in $1\frac{1}{3}$? in $1\frac{2}{3}$? in 2? Express $\frac{4}{3}$ and $\frac{5}{3}$ as whole numbers and fractions. Express $\frac{6}{3}$ as a whole number.

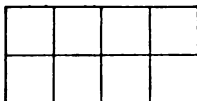
WRITTEN EXERCISE

1. $\frac{1}{4}$ of 36 + $\frac{1}{2}$ of 20.
2. $\frac{1}{4}$ of 36 - $\frac{1}{2}$ of 12.
3. $\frac{3}{4}$ of 32 + $\frac{1}{6}$ of 30.
4. $\frac{3}{4}$ of 32 - $\frac{1}{6}$ of 24.
5. 24 + $\frac{1}{3}$ of 24, or $1\frac{1}{3}$ times 24.
6. 36 + $\frac{2}{3}$ of 36, or $1\frac{2}{3}$ times 36.
7. 50 + $\frac{1}{2}$ of 50, or $\frac{3}{2}$ of 50.
8. $\frac{4}{5}$ of 15; of 21; of 33; of 36.
9. $\frac{3}{2}$ of 16; of 20; of 30; of 40.
10. At 30 ct. a dozen for oranges, and 24 ct. a dozen for lemons, what will $\frac{1}{2}$ doz. of each cost?

ORAL EXERCISE

1. Draw this rectangle on the blackboard, and point to $\frac{1}{2}$ of it; to $\frac{1}{4}$; to $\frac{1}{8}$.

2. From the picture show that $\frac{4}{8} = \frac{2}{4} = \frac{1}{2}$.



3. If you call the rectangle 2, point to 1; to $\frac{1}{4}$; to $1\frac{1}{4}$; to $1\frac{1}{4} - \frac{1}{2}$. How much is $1\frac{1}{4} - \frac{1}{2}$?

4. In the same way, point to $1\frac{1}{2} - \frac{3}{4}$. How much is it?

5. How much is $1\frac{3}{4} - \frac{1}{2}$?

6. Calling the whole rectangle 1, point to $\frac{7}{8} - \frac{1}{4}$; to $\frac{7}{8} - \frac{1}{2}$; to $\frac{3}{4} - \frac{1}{2}$; to $\frac{3}{4} - \frac{1}{8}$.

If we ask for the sum of 3 apples and 1 orange, the answer cannot be apples alone, nor oranges alone. But if we ask for the sum of 3 pieces of fruit and 1 piece of fruit, the answer is 4 pieces of fruit. *In adding, we think of things as having the same name.*

In the same way, if we ask for the sum of $\frac{3}{4}$ and $\frac{1}{2}$, the answer cannot be fourths alone, nor halves alone. But if we ask for the sum of $\frac{3}{4}$ and $\frac{2}{4}$, the answer is $\frac{5}{4}$, or $1\frac{1}{4}$. *In adding, we think of fractions as having the same name.*

That which tells the name of the parts is the number below the line. It is called the *denominator*.

That which tells the number of the parts is the number above the line. It is called the *numerator*.

To add or subtract fractions, they are thought of as having the same denominator.

ORAL EXERCISE

1. How much is $\frac{3}{4} + \frac{1}{4}$? $\frac{3}{4} + \frac{2}{4}$? $\frac{3}{4} + \frac{1}{2}$?
2. How much is $\frac{3}{4} - \frac{1}{4}$? $\frac{3}{4} - \frac{2}{4}$? $\frac{3}{4} - \frac{1}{2}$?
3. How much is $\frac{5}{4} + \frac{3}{4}$? $1\frac{1}{4} + \frac{3}{4}$? $2\frac{1}{4} + \frac{3}{4}$?
4. How much is $\frac{5}{4} - \frac{3}{4}$? $1\frac{1}{4} - \frac{3}{4}$? $2\frac{1}{4} - \frac{3}{4}$?
5. How much is $\frac{9}{8} + \frac{7}{8}$? $\frac{9}{8} - \frac{7}{8}$? $1\frac{1}{8} + \frac{7}{8}$? $1\frac{1}{8} - \frac{7}{8}$?

The teacher should resort to diagrams on the blackboard or to the use of objects whenever necessary, but not otherwise.

6. How much is $1\frac{1}{8} + \frac{5}{8}$? $1\frac{1}{8} - \frac{5}{8}$? $1\frac{3}{8} + \frac{5}{8}$? $1\frac{3}{8} - \frac{5}{8}$?
7. How much is $2\frac{3}{8} + \frac{1}{8}$? $2\frac{3}{8} + \frac{5}{8}$? $2\frac{3}{8} + \frac{2}{8}$, or $2\frac{3}{8} + \frac{1}{4}$?
8. How much is $3\frac{3}{8} + \frac{5}{8}$? $3\frac{3}{8} - \frac{5}{8}$? $5\frac{3}{8} + 1\frac{5}{8}$? $6\frac{7}{8} + \frac{1}{8}$? $6\frac{7}{8} + \frac{2}{8}$, or $6\frac{7}{8} + \frac{1}{4}$?
9. How much is $\frac{4}{8} + \frac{1}{8}$? $\frac{1}{2} + \frac{1}{8}$? $\frac{4}{8} - \frac{1}{8}$? $\frac{1}{2} - \frac{1}{8}$? $3\frac{1}{2} - \frac{1}{8}$? $3\frac{1}{2} - 2\frac{1}{8}$?
10. How much is $\frac{2}{4} + \frac{1}{4}$? $\frac{1}{2} + \frac{1}{4}$? $\frac{2}{4} - \frac{1}{4}$? $\frac{1}{2} - \frac{1}{4}$? $3\frac{1}{2} - \frac{1}{4}$? $5\frac{1}{2} - 3\frac{1}{4}$?

To add $25\frac{7}{8}$ and $32\frac{1}{2}$, you may think of $\frac{1}{2}$ as $\frac{4}{8}$, and add thus:

$$\begin{array}{r} 25\frac{7}{8} \\ 32\frac{4}{8} \\ \hline 57\frac{11}{8} = 58\frac{3}{8} \end{array}$$

To subtract $25\frac{7}{8}$ from $32\frac{1}{2}$, you may also think of the $\frac{1}{2}$ as $\frac{4}{8}$, and subtract thus:

$$\begin{array}{r} 32\frac{4}{8} = 31\frac{12}{8} \\ 25\frac{7}{8} \\ \hline 6\frac{5}{8} \end{array}$$

WRITTEN EXERCISE

1. $27\frac{1}{8} + 35\frac{1}{4}$.
2. $29\frac{7}{8} - 17\frac{3}{8}$.
3. $43\frac{1}{2} - 31\frac{3}{8}$.
4. $33\frac{3}{4} + 21\frac{3}{8}$.
5. $33\frac{3}{4} - 21\frac{3}{8}$.
6. $62\frac{1}{8} - 26\frac{1}{4}$.
7. $25\frac{1}{4} + 18\frac{7}{8}$.
8. $25\frac{1}{4} - 18\frac{7}{8}$.
9. $75\frac{1}{2} - 62\frac{7}{8}$.
10. $32\frac{1}{2} + 14\frac{5}{8}$.
11. $32\frac{1}{2} - 14\frac{5}{8}$.
12. $39\frac{1}{4} - 20\frac{5}{8}$.

ORAL EXERCISE

1. If you divide a line into 3 equal parts, what is the name of each part? If you take 2 of the parts, you have what fraction of the line?

2. In the fraction which you found, what is the name of the parts? Then what is the denominator? What is the number of the parts? Then what is the numerator?

3. If you divide a circle into 5 equal parts, and color 2 of them red and 1 blue, what part is red? What part is blue? What part is uncolored? Name the numerators and the denominators.

4. If you divide a line into 10 equal parts, and color 3 of the parts red and the rest blue, the red is what part of the line? The blue is what part? Name the numerators and the denominators.

WRITTEN EXERCISE

1. Draw a rectangle 4 in. long and 1 in. high. Divide it into 8 equal rectangles, each $\frac{1}{2}$ in. long. Shade $\frac{5}{8}$ of the rectangle.

2. Copy, writing in the missing numbers:

$$\frac{5}{8} + \frac{1}{8} = \frac{?}{8} = \frac{?}{4}$$

$$\frac{3}{8} + \frac{3}{8} = \frac{?}{8} = \frac{?}{4}$$

$$\frac{3}{8} + \frac{1}{4} = \frac{3}{8} + \frac{?}{8} = \frac{?}{8}$$

$$\frac{5}{8} + \frac{1}{4} = \frac{5}{8} + \frac{?}{8} = \frac{?}{8}$$

3. Copy, writing in the missing numbers:

$$\frac{2}{4} = \frac{?}{2}$$

$$\frac{1}{2} + \frac{1}{4} = \frac{?}{4}$$

$$\frac{1}{2} - \frac{1}{4} = \frac{?}{4}$$

$$\frac{3}{4} - \frac{1}{4} = \frac{2}{?} = \frac{?}{2}$$

ORAL EXERCISE

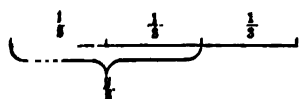
1. If we divide an apple into thirds, and each third into halves, what parts have we?

2. From this cutting of the apple we see that $\frac{1}{2}$ of $\frac{1}{3}$ is what fraction? How much is $\frac{1}{3}$ of $\frac{1}{2}$?

3. How much is $\frac{1}{3}$ of 12? $\frac{1}{2}$ of 12? $\frac{1}{3}$ of $\frac{1}{2}$ of 12? $\frac{1}{2}$ of $\frac{1}{3}$ of 12? $\frac{1}{6}$ of 12? $\frac{2}{3}$ of 12? $\frac{1}{2}$ of $\frac{2}{3}$ of 12?

4. Draw on the blackboard a line 6 in. long, and mark off the inches. Point to $\frac{1}{3}$ of the line; to $\frac{1}{6}$; to $\frac{1}{2}$; to $\frac{1}{2}$ of $\frac{1}{3}$; to $\frac{2}{3}$; to $\frac{1}{2}$ of $\frac{2}{3}$.

5. How many inches are there in $\frac{1}{3}$ ft.? in $\frac{1}{6}$ ft.? in $\frac{1}{2}$ of $\frac{1}{3}$ ft.? in $\frac{1}{3}$ of $\frac{1}{2}$ ft.?



6. Draw this figure on the blackboard. Show from it that $\frac{1}{2}$ of $\frac{2}{3} = \frac{1}{3}$; that $\frac{2}{3} + \frac{1}{3} = 1$; and that $1 - \frac{1}{3} = \frac{2}{3}$.

WRITTEN EXERCISE

1. Draw a line and divide it so as to show that $\frac{2}{3}$ of $\frac{1}{2} = \frac{1}{3}$.

2. Draw a line and divide it so as to show that $\frac{1}{2}$ of $\frac{1}{3} = \frac{1}{6}$.

Copy the following and write the results:

3. $\frac{1}{3}$ of 18, $\frac{1}{2}$ of 18, $\frac{1}{6}$ of 18, $\frac{5}{6}$ of 18.

4. $\frac{1}{3}$ of 24, $\frac{2}{3}$ of 24, $\frac{1}{6}$ of 24, $\frac{5}{6}$ of 24.

5. $\frac{1}{2}$ of 30, $\frac{2}{3}$ of 30, $\frac{1}{6}$ of 30, $\frac{5}{6}$ of 30.

6. $\frac{1}{3}$ of 36, $\frac{2}{3}$ of 36, $\frac{1}{6}$ of 36, $\frac{5}{6}$ of 36.

7. $\frac{1}{2}$ of 42, $\frac{1}{3}$ of 42, $\frac{1}{6}$ of 42, $\frac{1}{7}$ of 42.

ORAL EXERCISE

1. Add $10\frac{7}{8}$, $9\frac{1}{8}$, $2\frac{1}{2}$.
2. Add $15\frac{5}{8}$, $4\frac{1}{6}$, $3\frac{1}{3}$.
3. Add $12\frac{1}{2}$, $2\frac{1}{4}$, $\frac{1}{4}$, 5.
4. From $10\frac{7}{8}$ subtract $5\frac{5}{8}$.
5. From $20\frac{1}{8}$ subtract 5; then subtract $\frac{3}{8}$.
6. From $15\frac{3}{8}$ subtract $5\frac{5}{8}$; then subtract $\frac{3}{4}$.
7. If your books weigh $2\frac{1}{2}$ lb., and you weigh $57\frac{3}{4}$ lb., how much do you and the books weigh?
8. If you need $7\frac{3}{8}$ yd. of carpet for a school platform, and $3\frac{3}{4}$ yd. for the steps, how much do you need for both?

WRITTEN EXERCISE

Add the numbers in Exs. 1-8:

- | | | | |
|---------------------|---------------------|---------------------|----------------------|
| 1. $223\frac{1}{8}$ | 2. $421\frac{1}{4}$ | 3. $226\frac{1}{3}$ | 4. $1129\frac{2}{3}$ |
| $42\frac{3}{8}$ | $237\frac{1}{2}$ | $342\frac{1}{6}$ | $6342\frac{2}{3}$ |
| $65\frac{7}{8}$ | $342\frac{1}{8}$ | $427\frac{1}{6}$ | $4826\frac{2}{3}$ |
| <hr/> | <hr/> | <hr/> | <hr/> |
| 5. $142\frac{1}{8}$ | 6. $329\frac{7}{8}$ | 7. $419\frac{5}{8}$ | 8. $2829\frac{1}{8}$ |
| $273\frac{1}{4}$ | $247\frac{5}{8}$ | $127\frac{1}{8}$ | $4623\frac{1}{2}$ |
| $821\frac{5}{8}$ | $833\frac{3}{8}$ | $293\frac{1}{6}$ | $6481\frac{2}{3}$ |
| $227\frac{1}{2}$ | $607\frac{1}{2}$ | $427\frac{5}{8}$ | $892\frac{1}{8}$ |
| <hr/> | <hr/> | <hr/> | <hr/> |

Subtract in Exs. 9-16:

- | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|
| 9. $8426\frac{1}{4}$ | 10. $2163\frac{1}{6}$ | 11. $8240\frac{3}{8}$ | 12. $4035\frac{1}{4}$ |
| $4025\frac{1}{2}$ | $293\frac{1}{2}$ | $642\frac{1}{2}$ | $630\frac{7}{8}$ |
| <hr/> | <hr/> | <hr/> | <hr/> |
| 13. $8142\frac{1}{8}$ | 14. $4021\frac{1}{6}$ | 15. $2003\frac{1}{3}$ | 16. $4223\frac{1}{2}$ |
| $296\frac{7}{8}$ | $683\frac{2}{3}$ | $729\frac{5}{8}$ | $826\frac{5}{8}$ |
| <hr/> | <hr/> | <hr/> | <hr/> |

ORAL EXERCISE

1. How much is $\frac{1}{3}$ of 42? $\frac{2}{3}$ of 42?
2. How much is $\frac{1}{8}$ of 88? $\frac{3}{8}$ of 88? $\frac{5}{8}$ of 88?
 $\frac{7}{8}$ of 88?
3. How much is $\frac{1}{4}$ of 36? $\frac{3}{4}$ of 36? $\frac{1}{4}$ of \$48?
 $\frac{3}{4}$ of \$48?
4. How much is $\frac{1}{5}$ of \$5.05? $\frac{2}{5}$ of \$5.05? $\frac{3}{5}$ of \$5.05?
 $\frac{4}{5}$ of \$5.05?

We call the taking of $\frac{2}{3}$ of 12 the *multiplication* of 12 by $\frac{2}{3}$. When we use the sign \times in multiplying by a fraction, we read it "of." Thus, $\frac{2}{3} \times 15$ is read " $\frac{2}{3}$ of 15."

To multiply 15 by $\frac{2}{3}$, you have seen that you take $\frac{1}{3}$ of 15, which is 5, and multiply this by 2, giving 10.

WRITTEN EXERCISE

1. $\frac{2}{3}$ of 63.
2. $\frac{2}{3}$ of 75.
3. $\frac{2}{3}$ of 96.
4. $\frac{3}{4}$ of 68.
5. $\frac{3}{4}$ of 72.
6. $\frac{3}{4}$ of 96.
7. $\frac{2}{5}$ of 75.
8. $\frac{2}{5}$ of 75.
9. $\frac{4}{5}$ of 75.
10. $\frac{5}{8}$ of 66.
11. $\frac{5}{8}$ of 72.
12. $\frac{5}{8}$ of 96.
13. $\frac{3}{8}$ of 168.
14. $\frac{3}{8}$ of 184.
15. $\frac{3}{8}$ of 232.
16. $\frac{5}{8}$ of 344.
17. $\frac{5}{8}$ of 424.
18. $\frac{5}{8}$ of 568.
19. Rob has 56 chickens and $\frac{5}{8}$ of them are white. How many are white?
20. Will has 12 doz. marbles and $\frac{7}{8}$ of them are glass. How many marbles are glass?
21. There are 336 pupils in a certain school and $\frac{3}{8}$ are boys. How many are boys?

ORAL EXERCISE

1. How much is $\frac{3}{8}$ of 40? $1\frac{3}{8}$ times 40?
2. How much is $\frac{2}{5}$ of 10? $1\frac{2}{5}$ times 10?
3. Multiply 20 by 3; by $\frac{1}{5}$; by $3\frac{1}{5}$; by $3\frac{2}{5}$.
4. Multiply 16 by 2; by $\frac{1}{8}$; by $2\frac{1}{8}$; by $2\frac{3}{8}$; by $2\frac{5}{8}$.
5. How much is $2\frac{1}{2}$ times 20? 40? 50? 100? 200?
6. How much is $2\frac{1}{3}$ times 6? 9? 12? 15? 18? 21?

You have seen that to multiply a number by 23 you first multiply by 3 and then by 20, and add the results. So, to multiply by $2\frac{3}{5}$, you first multiply by $\frac{3}{5}$ and then by 2, and add the results.

$$\begin{array}{r}
 165 \\
 \underline{2\frac{3}{5}} \\
 99 \text{ product by } \frac{3}{5} \\
 330 \quad \text{"} \quad \text{"} \quad 2 \\
 \underline{429} \quad \text{"} \quad \text{"} \quad 2\frac{3}{5}
 \end{array}$$

WRITTEN EXERCISE

Multiply:

1. 141 by $2\frac{1}{2}$. 2. 156 by $3\frac{3}{5}$. 3. 184 by $5\frac{3}{4}$.
4. 145 by $6\frac{1}{2}$. 5. 606 by $11\frac{1}{8}$. 6. 426 by $11\frac{5}{8}$.
7. \$125 by $2\frac{1}{5}$. 8. \$225 by $4\frac{2}{5}$. 9. \$175 by $3\frac{2}{5}$.
10. \$6.40 by $2\frac{3}{4}$. 11. \$8.20 by $5\frac{3}{4}$. 12. \$4.08 by $10\frac{3}{4}$.
13. \$27.50 14. \$26.52 15. \$15.51 16. \$14.55
- $\underline{12\frac{1}{2}}$ $\underline{33\frac{1}{2}}$ $\underline{66\frac{2}{3}}$ $\underline{16\frac{2}{3}}$
17. \$31.15 18. \$42.75 19. \$60.05 20. \$41.35
- $\underline{21\frac{1}{5}}$ $\underline{32\frac{2}{5}}$ $\underline{14\frac{3}{5}}$ $\underline{15\frac{4}{5}}$
21. What will $6\frac{3}{4}$ yd. of cloth cost at \$2.40 a yard?
22. What will $7\frac{3}{8}$ yd. of silk cost at \$3.20 a yard?
23. What will $3\frac{5}{8}$ doz. fountain pens cost at \$1.20 each?

ORAL EXERCISE

1. Tell the cost of some kind of cloth. How much will $10\frac{1}{2}$ yd. cost?

2. Tell the cost of a pair of shoes. How much will 2 pairs cost?

3. If a man earns \$3 for 10 hours' work, how many hours must he work to earn enough to buy his daughter a pair of shoes at \$1.50?

4. How many hours must he work to earn enough to buy a \$6 suit of clothes for his son?

WRITTEN EXERCISE

1. Sarah's mother bought $4\frac{1}{4}$ yd. of cloth for a cloak, at \$1.25 a yard. What did she pay for it?

2. She also bought $3\frac{1}{2}$ yd. of lining at 50 ct. a yard, and $4\frac{1}{4}$ yd. of braid at 20 ct. a yard. How much did these cost?

3. She also bought 6 pearl buttons at \$1.50 a dozen, and 2 spools of silk at 8 ct. a spool. How much did these cost?

4. The dressmaker charged \$5 for making the cloak. What did materials and making cost?

5. John's mother bought $2\frac{1}{2}$ yd. of goods for a coat, at \$1.20 a yard, and $2\frac{1}{4}$ yd. of lining at 48 ct. a yard. How much did these cost?

6. She also bought a dozen buttons at 25 ct. a dozen, and 2 spools of silk at 8 ct. a spool, and paid \$3 for making. How much did the coat cost?

WRITTEN EXERCISE

Multiply in Exs. 1-24:

- | | |
|------------------------|------------------------|
| 1. 321×123 . | 2. 286×268 . |
| 3. 242×375 . | 4. 481×192 . |
| 5. 327×228 . | 6. 183×427 . |
| 7. 231×247 . | 8. 820×102 . |
| 9. 207×306 . | 10. 401×209 . |
| 11. 608×103 . | 12. 201×208 . |
| 13. 160×340 . | 14. 218×316 . |
| 15. 708×130 . | 16. 300×140 . |
| 17. \$27.42 by 69. | 18. \$29.36 by 78. |
| 19. \$68.39 by 75. | 20. \$41.78 by 69. |
| 21. \$181.75 by 65. | 22. \$235.40 by 96. |
| 23. \$371.82 by 64. | 24. \$491.30 by 82. |

Divide in Exs. 25-41:

- | | | |
|-------------------------|-------------------------|-----------------|
| 25. 4860 by 30. | 26. 2940 by 70. | 27. 3840 by 80. |
| 28. 2639 by 30. | 29. 4862 by 70. | 30. 2983 by 80. |
| 31. 6437 by 50. | 32. 4963 by 60. | 33. 8274 by 40. |
| 34. $83,468 \div 308$. | 35. $48,884 \div 202$. | |
| 36. $55,825 \div 275$. | 37. $38,720 \div 128$. | |
| 38. $81,375 \div 250$. | 39. $56,520 \div 240$. | |
| 40. $16,421 \div 153$. | 41. $22,742 \div 204$. | |

Multiply in Exs. 42-51:

- | | | |
|---|--|--|
| 42. $236 \text{ by } 15\frac{3}{4}$. | 43. $327 \text{ by } 16\frac{2}{3}$. | 44. $296 \text{ by } 16\frac{1}{8}$. |
| 45. $345 \text{ by } 23\frac{1}{4}$. | 46. $288 \text{ by } 17\frac{5}{8}$. | 47. $824 \text{ by } 25\frac{5}{8}$. |
| 48. $291 \text{ by } 127\frac{1}{8}$. | 49. $345 \text{ by } 125\frac{3}{5}$. | 50. $488 \text{ by } 137\frac{3}{8}$. |
| 51. $2746\frac{1}{8} + 14\frac{3}{4} + 196\frac{1}{2} + 328\frac{3}{8} + 146\frac{1}{4} + 261\frac{3}{8}$. | | |

WRITTEN EXERCISE

In Exs. 1-12, first perform the operation indicated in the parenthesis :

1. $6278 - (142 + 387)$.
2. $4821 - (2873 - 684)$.
3. $\frac{3}{4}$ of $(14\frac{3}{4} + 2\frac{1}{2} - 2\frac{1}{4})$.
4. $\frac{3}{8}$ of $(21\frac{3}{8} + 4\frac{1}{8} - 1\frac{1}{8})$.
5. $2834\frac{1}{2} - (186\frac{7}{8} + 249\frac{3}{8})$.
6. $4423\frac{1}{4} - (287\frac{1}{8} - 142\frac{3}{4})$.
7. $2893\frac{1}{8} - (447\frac{1}{4} - 329\frac{7}{8})$.
8. $6882\frac{3}{8} - (278\frac{1}{4} - 149\frac{3}{8})$.
9. $22\frac{3}{8} \times (16\frac{7}{8} + 14\frac{1}{2} + 3\frac{5}{8})$.
10. $21\frac{7}{8} \times (216\frac{1}{8} + 33\frac{3}{8} + 6\frac{1}{8})$.
11. $27\frac{1}{4} \times (162\frac{3}{4} + 48\frac{1}{2} - 5\frac{1}{4})$.
12. $12\frac{3}{8} \times (243\frac{1}{2} + 268\frac{3}{8} + 4\frac{1}{8})$.

Divide :

- | | |
|--|-------------------------|
| 13. $91,280 \div 65$. | 14. $87,892 \div 43$. |
| 15. $36,800 \div 68$. | 16. $49,894 \div 202$. |
| 17. $41,250 \div 275$. | 18. $58,100 \div 175$. |
| 19. $58,432 \div 332$. | 20. $58,125 \div 465$. |
| 21. $85,794 \div 384$. | 22. $81,468 \div 374$. |
| 23. $70,882 \div 197$. | 24. $17,856 \div 144$. |
| 25. $30,576 \div 126$. | 26. $20,366 \div 105$. |
| 27. $20,394 \div 120$. | 28. $63,844 \div 135$. |
| 29. $32,426 \div 225$. | 30. $77,316 \div 378$. |
| 31. $65,664 \div 912$. | 32. $18,149 \div 127$. |
| 33. $39,895 \div (52\frac{7}{8} + 89 + 27\frac{3}{8} - 68\frac{1}{4})$. | |
| 34. $43,452 \div (231\frac{1}{8} + 71\frac{5}{8} + 262\frac{3}{8} - 139\frac{5}{8})$. | |

DENOMINATE NUMBERS

ORAL EXERCISE

1. How many inches are there in 2 ft. 4 in.?
2. How many inches are there in 1 yd. 10 in.?
3. How many ounces are there in 1 lb. 10 oz.?
4. Express 8 oz. as a fraction of a pound. Express $1\frac{1}{2}$ lb. as ounces; also $1\frac{1}{4}$ lb. as ounces.
5. Express 18 sq. ft. as square yards. Express $1\frac{1}{8}$ sq. yd. as square feet.

Numbers having the unit of measure attached are called *denominate numbers*.

Thus, 2 ft., 3 mi., \$5, are denominate numbers.

In the above examples you found that a number may be expressed with different denominations. Thus, $1\frac{1}{2}$ lb. may be expressed as 24 oz., or 14 in. as $1\frac{1}{8}$ ft.

Express 64 in. as feet.

Since there are 12 in. in 1 ft., there are as many feet in 64 in. as there are 12 in. in 64 in.

But $64 \text{ in.} \div 12 \text{ in.} = 5$, and 4 in. remainder.

Therefore, there are 5 ft. 4 in. in 64 in.

Express 7 ft. as inches.

Since in 1 ft. there are 12 in., in 7 ft. there are 7 times 12 in., or 84 in.

WRITTEN EXERCISE

Express:

- | | |
|----------------------------------|-------------------------|
| 1. 21 qt. as pints. | 2. 32 qt. as gallons. |
| 3. 22 bu. as pecks. | 4. 12 da. as hours. |
| 5. \$23 $\frac{1}{2}$ as cents. | 6. 25 min. as seconds. |
| 7. $1\frac{3}{4}$ lb. as ounces. | 8. 540 sec. as minutes. |

ORAL EXERCISE

1. Look at the foot rule and tell how many inches make a foot.
2. Measure the yardstick with the foot rule and tell how many feet make a yard.
3. Measure $16\frac{1}{2}$ ft. along the floor. Do you know what this length is called?
4. Do you know of two houses or streets near your school that are a mile apart?
5. How many feet in 25 yd.? in $33\frac{1}{3}$ yd.?
6. How many yards in 25 ft.? in 45 ft.?

The teacher should assist the pupils to visualize these basal units. In cities the number of blocks to the mile, the number of rods in the width of the streets, and the average size of building lots should be known.

TABLE OF LENGTH

12 inches (in.) = 1 foot (ft.).

3 feet = 1 yard (yd.).

$16\frac{1}{2}$ feet = 1 rod (rd.).

5280 feet = 320 rods = 1 mile (mi.).

WRITTEN EXERCISE

1. How many feet in $5\frac{1}{2}$ yd.? How many rods?
2. How many feet in $\frac{1}{2}$ mi.? in $\frac{1}{4}$ mi.? in $\frac{1}{8}$ mi.?
3. How many rods in $\frac{1}{2}$ mi.? in $\frac{1}{4}$ mi.? in $\frac{1}{8}$ mi.?
4. How many inches in 1 yd.? in 1 rd.? in 1 mi.?
5. How many miles in 640 rd.? in 5440 rd.?
6. How many yards in 792 ft.? in 1065 ft.?

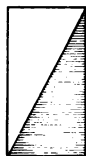
ORAL EXERCISE

1. How do the areas of these triangles compare with the areas of the rectangles?

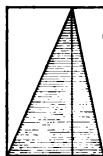
2. If the rectangle A is called 1, what is triangle A?

If the rectangle is 8 sq. in., what is the triangle?

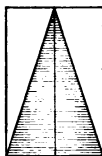
3. If the rectangle B is called 10, what is triangle B?



A



B



C

4. If rectangle C is 4 in. long and 6 in. high, what is its area? What is the area of the triangle?

The *base* of a *figure* is the line on which it stands.

You have found that a *triangle is equal to half the rectangle of the same base and height.*

If the base of a triangle is 6 in. and the height is 10 in., the area is $\frac{1}{2}$ of 10×6 times 1 sq. in., or 30 sq. in.

WRITTEN EXERCISE

Find the perimeter and area in Exs. 1-3:

1. Rectangle: length 31 ft., height 18 ft.
2. Rectangle: length 50 ft., height 37 ft.
3. Rectangle: length 15 ft., height $4\frac{1}{3}$ ft.

Find the area in Exs. 4-6:

4. Triangle: base 40 in., height 27 in.
5. Triangle: base 47 yd., height 18 yd.
6. Triangle: base 31 ft., height 24 ft.

ORAL EXERCISE

1. What name do you give an angle less than a right angle? one greater than a right angle?
2. Draw upon the blackboard the three kinds of angles about which you have learned. Name each.
3. Draw upon the blackboard two parallel lines; two vertical lines; two horizontal lines.

A four-sided figure whose opposite sides are parallel is called a *parallelogram*.

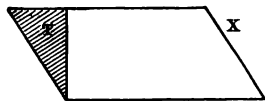
WRITTEN EXERCISE

1. Here is a picture showing that a triangle is half of a parallelogram of the same base and height. Draw one for a right-angled triangle and one for an acute-angled triangle.



2. What is the area of a rectangle $7\frac{1}{2}$ in. by 8 in.? also of a triangle whose base is $7\frac{1}{2}$ in. and height 8 in.? Draw a picture of each.

3. Suppose you should cut from this parallelogram the triangle T and put it over where X is; what kind of a figure would you have? Draw the two figures.

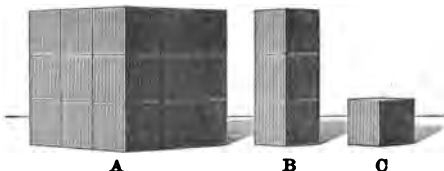


We see from Ex. 3 that *the area of a parallelogram equals that of a rectangle of the same base and height.*

4. What is the area of a parallelogram whose base is $8\frac{1}{4}$ in. and whose height is 6 in.?

ORAL EXERCISE

1. The cube A is how many times B? C? Then a cube 3 in. on an edge is how many times one that is 1 in. on an edge?



2. How many feet in 1 yd.? Then how many cubic feet in 1 cu. yd.?

3. How would you find the number of cubic inches in 1 cu. ft.? Multiply on the blackboard and find this number.

You have found that

$$12 \times 12 \times 12 \text{ times } 1 \text{ cu. in.} = 1 \text{ cu. ft.},$$

$$3 \times 3 \times 3 \text{ times } 1 \text{ cu. ft.} = 1 \text{ cu. yd.};$$

or that

$$1728 \text{ cubic inches} = 1 \text{ cubic foot (cu. ft.).}$$

$$27 \text{ cubic feet} = 1 \text{ cubic yard (cu. yd.).}$$

WRITTEN EXERCISE

1. A bin is 2 ft. by 3 ft. by 5 ft. It holds how much more than 1 cu. yd.?

2. A box is 20 in. by 8 in. by 10 in. It holds how much less than 1 cu. ft.?

3. How many cubic inches in a prism 5 in. by 17 in. by 13 in.?

4. How many cubic yards in a schoolroom 21 ft. by 18 ft. by 12 ft.?

ORAL EXERCISE

1. This boy is 4 ft. high. Estimate the dimensions of this wood pile. Do you know the name of this amount of wood?



2. Sugar is sold by the pound. How is coal sold? How is cloth sold? How is wood sold? What are the dimensions of this amount of wood?

A pile of wood 8 ft. by 4 ft. by 4 ft. is called a *cord*.
A cord contains $8 \times 4 \times 4$ times 1 cu. ft., or 128 cu. ft.

REVIEW OF THE TABLES

3. Give the table of time.
4. Give the table of weight.
5. Give the table of dry measure.
6. Give the table of square measure.
7. Give the table of liquid measure.

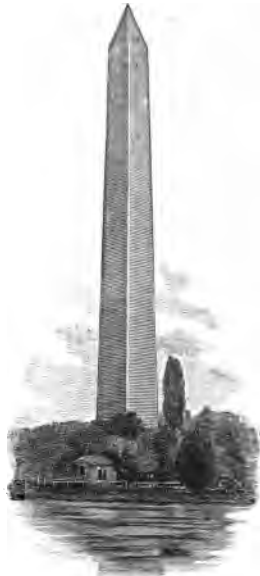
ORAL EXERCISE

1. The great monument to Washington is $555\frac{1}{2}$ ft. high. This is 555 ft. and how many inches?

2. It is 55 ft. square at the base. It is about how many times as high as it is square?

3. If the monument were 560 ft. high, it would be how many times as high as a 40-ft. school building?

4. Calling the monument 555 ft. high, this is how many times the height of a spire that is 111 ft. high?



WRITTEN EXERCISE

1. The base being 55 ft. square, what is its area?

2. How many yards high is the monument?

3. If the sides were rectangles 540 ft. long and 55 ft. wide, what would be the area of each?

4. Then the total area, up to the sloping top, would be how many square feet?

5. If the volume is 60,500 cu. yd., half being stone, how many cubic yards of stone?

6. If this stone weighs 2 tons to the cubic yard, how many tons of stone are there?

ORAL EXERCISE

1. How many feet are 8 in. and 4 in.?
2. How many feet are 1 ft. 8 in. and 1 ft. 4 in.?
3. How many hours are 100 min. and 20 min.?
4. Add 2 hr. 40 min. and 3 hr. 20 min.

Denominate numbers are added much like other numbers. For example, to add 10 ft. 9 in. and 6 ft. 8 in., we may think: 10 ft. 9 in.
 9 in. and 8 in. are 17 in., which is $\begin{array}{r} 6 \quad 8 \\ \hline \end{array}$
 1 ft. 5 in. Adding the 1 ft. to 6 ft. + 17 ft. 5 in.
 10 ft., we have 17 ft. Therefore, the sum is 17 ft. 5 in.

WRITTEN EXERCISE

Add in Exs. 1-9:

- | | | |
|---|---|--|
| 1. 17 ft. 10 in.
$\begin{array}{r} 29 \quad 10 \\ \hline \end{array}$ | 2. 16 yd. 25 in.
$\begin{array}{r} 37 \quad 13 \\ \hline \end{array}$ | 3. 35 gal. 2 qt.
$\begin{array}{r} 47 \quad 3 \\ \hline \end{array}$ |
| 4. 91 ft. 7 in.
$\begin{array}{r} 62 \quad 8 \\ 74 \quad 3 \\ \hline \end{array}$ | 5. 97 yd. 1 ft.
$\begin{array}{r} 63 \quad 2 \\ 127 \quad 0 \\ \hline \end{array}$ | 6. 75 bu. 2 pk.
$\begin{array}{r} 89 \quad 3 \\ 66 \quad 0 \\ \hline \end{array}$ |
| 7. 89 lb. 14 oz.
$\begin{array}{r} 16 \quad 6 \\ 83 \quad 5 \\ \hline \end{array}$ | 8. 63 yd. 2 in.
$\begin{array}{r} 87 \quad 15 \\ 135 \quad 14 \\ \hline \end{array}$ | 9. 59 lb. 9 oz.
$\begin{array}{r} 72 \quad 8 \\ 67 \quad 6 \\ \hline \end{array}$ |

Weights are usually given in pounds and fractions, as $50\frac{1}{2}$ lb. or $58\frac{3}{4}$ lb. Lengths are, if short, usually given in feet and inches, or in yards and a fraction, or in miles and a fraction. Gallons and quarts or bushels and pecks are seldom used together.

ORAL EXERCISE

1. How much is 18 in. - 9 in.? 1 ft. 6 in. - 9 in.?
2. How many inches are 2 ft. 6 in. - 1 ft. 9 in.?
3. How much is 1 hr. 40 min. - 50 min.?
4. How much is 1 lb. 4 oz. - 9 oz.?

Denominate numbers are subtracted much like other numbers. For example, to subtract 10 ft. 9 in. from 17 ft. 5 in., we may think: 5 in. - 9 in. is impossible, but we see that 1 ft. 5 in. - 9 in. = 8 in. Then 16 ft. - 10 ft. = 6 ft., for we have used 1 ft. of the 17 ft.

$$\begin{array}{r} 17 \text{ ft. } 5 \text{ in.} \\ 10 \quad 9 \\ \hline 6 \text{ ft. } 8 \text{ in.} \end{array}$$

WRITTEN EXERCISE

1. 19 ft. 3 in. - 5 ft. 7 in.
2. 16 yd. 7 in. - 12 yd. 20 in.
3. 287 ft. 8 in. - 175 ft. 10 in.
4. 154 gal. 2 qt. - 48 gal. 3 qt.
5. 17 mi. 100 ft. - 10 mi. 1000 ft.

In walking a man sometimes carries a pedometer (pe-dom'e-ter), which shows the number of miles he has walked.

6. If a man starts with it set at $\frac{3}{4}$ mi., how far has he walked now that the hand points to $1\frac{3}{4}$ mi. when it points to 6 mi.?

7. If he starts with it at $2\frac{1}{2}$ mi., and walks until it indicates $9\frac{1}{4}$ mi., how far has he walked?



ORAL EXERCISE

1. Measure the length and width of your geography. How many square inches on each page?
2. Measure the length and width of your arithmetic. How many square inches on each page?
3. How many more square inches in a 4-in. square than in a 2-in. square? The first is how many times as large as the second?
4. There are two rectangles, one 5 in. by 6 in., the other 3 in. by 10 in. Find the area of each.
5. What is the area of a rectangle 8 in. by 4 in.? What is the area of a rectangle half as long and half as high?

WRITTEN EXERCISE

1. Find the number of square inches in a rectangle that is 25 in. by 36 in.
2. Draw the rectangle in Ex. 1, using $\frac{1}{8}$ in. to represent 1 in.

This is called drawing to a scale of $\frac{1}{8}$.

3. Compare the area of a 6-in. square with that of a rectangle 4 in. by 9 in. Draw each to a scale of $\frac{1}{8}$.

Find the number of square inches in the rectangles having the sides as given in Exs. 4-9:

- | | |
|----------------------|----------------------|
| 4. 38 in. by 72 in. | 5. 86 in. by 53 in. |
| 6. 32 in. by 48 in. | 7. 314 in. by 76 in. |
| 8. 79 in. by 792 in. | 9. 48 in. by 129 in. |

II. LARGER NUMBERS. INTEGERS, COMMON FRACTIONS, AND DECIMALS RELATED

COUNTING

ORAL EXERCISE

1. Count by 10's from 10 to 100.
2. Count by 100's from 100 to 1000.
3. Count by 1000's from 1000 to 10,000.
4. Count by 10,000's from 10,000 to 100,000.
5. Count by 100,000's from 100,000 to 900,000.

A thousand thousand is called a *million*. It is written 1,000,000.

6. Count by 1,000,000's from 1,000,000 to 10,000,000.

A thousand million is called a *billion*. It is written 1,000,000,000.

In writing numbers you have already learned that they are grouped by threes. These groups are called *periods*.

The different places, like units', tens', hundreds', are called *orders*.

Periods :	Billions' period		Millions' period		Thousands' period		Units' period	
	Tens Units		Hundreds Tens Units		Hundreds Tens Units		Hundreds Tens Units	
Orders :								
	27		346		,298		,735	

This is read: twenty-seven billion, three hundred forty-six million, two hundred ninety-eight thousand, seven hundred thirty-five.

ORAL EXERCISE

Read the numbers in Exs. 1-9:

1. 123,476. 2. 468,305. 3. 600,006.
4. 3,243,698. 5. 4,027,635. 6. 2,963,481.
7. 27,403,207. 8. 41,263,305. 9. 40,278,000.

10. About how many pupils are there in your school? About how many people in the village or city where you live? About how many are there in the state in which you live? About how many people in the United States?

WRITTEN EXERCISE

Write in words the numbers in Exs. 1-9:

1. 427,355. 2. 268,268. 3. 100,001.
4. 1,275,275. 5. 3,410,014. 6. 2,002,002.
7. 2,473,621. 8. 32,217,217. 9. 123,624,735.

10. Write the number having 6 in the units' order of millions' period, zeros in the thousands' period, and 275 in the units' period.

11. Write the numbers: twenty thousand twenty; two million, two hundred two; three hundred thousand, three hundred thirty-three.

12. Allowing 1 ft. to each person, how many persons would it take to make a line 1 mi. long? 10 mi. long? 100 mi. long? 200 mi. long?

13. How many seconds in 1 min.? in 60 min., or 1 hr.? in 24 hr., or 1 da.? in 365 da., or 1 yr.? in 10 yr.?

ADDITION

ORAL EXERCISE

1. 18 oz. = 1 lb. + how many ounces?
2. 34 oz. = 2 lb. + how many ounces?
3. Express as pounds and ounces: 10 oz. + 8 oz.;
15 oz. + 15 oz. + 4 oz.
4. Express as feet and inches: 17 in.; 10 in.
+ 7 in.; 1 ft. 10 in. + 7 in.

You have already seen that denominate numbers are added much like other numbers.

In this example you should
read the 9 oz. + 7 oz. as 1 lb.;
do not stop to say "16 oz."
Read the ounces' column as 1 lb.

$$\begin{array}{r} 4 \text{ lb. } 9 \text{ oz.} \\ 2 \quad 7 \\ \hline 6 \quad 11 \\ 13 \text{ lb. } 11 \text{ oz.} \end{array}$$

11 oz., and the pounds' column (with the 1 lb. added)
as 13 lb.

WRITTEN EXERCISE

See how long it takes to add these correctly. You will save time by adding rapidly from the bottom up, checking the work at once by adding from the top down.

1. \$52.20	2. 52 lb. 2 oz.	3. 52 ft. 2 in.
27.40	27 4	27 4
14.10	14 1	14 1
216.20	317 2 •	293 6
34.30	46 5	72 8
62.10	74 2	36 5
<u>47.10</u>	<u>26 3</u>	<u>90 2</u>

ORAL EXERCISE

A certain family of six persons used in one day :

Bread	1 lb. 8 oz.	Potatoes	2 lb.
Butter	5 oz.	Suet	8 oz.
Milk	2 lb. 8 oz.	Flour	1 lb. 4 oz.
Sugar	12 oz.	Molasses	6 oz.
Meat	2 lb.	Salt, etc.	5 oz.

1. What did the bread and butter weigh?
2. What did the bread and milk weigh?
3. A pint of milk weighs 1 lb. How many pints were used?
4. The suet weighed what part of a pound?
5. On an average, each person ate what part of 1 lb. of meat? what part of 1 lb. of potatoes?

WRITTEN EXERCISE

1. What is the total weight of the food mentioned above?
2. At 4 ct. a pound, how much did the bread cost?
3. Express the weight of the sugar as a fraction of a pound. At 8 ct. a pound, how much did it cost?
4. If 1 pt. of milk weighs 1 lb., how many quarts were used? If this cost 8 ct. a quart, how much did it all cost?
5. The meat cost 18 ct. a pound, and the potatoes 2 ct. a pound. How much did both cost for this family?

SUBTRACTION

ORAL EXERCISE

Subtract:

- | | | |
|--|--|--|
| 1. $\begin{array}{r} 22 \text{ oz.} \\ 14 \\ \hline \end{array}$ | 2. $\begin{array}{r} 1 \text{ lb. } 6 \text{ oz.} \\ 14 \\ \hline \end{array}$ | 3. $\begin{array}{r} \$1.16 \\ .14 \\ \hline \end{array}$ |
| 4. $\begin{array}{r} 18 \text{ in.} \\ 10 \\ \hline \end{array}$ | 5. $\begin{array}{r} 1 \text{ ft. } 6 \text{ in.} \\ 10 \\ \hline \end{array}$ | 6. $\begin{array}{r} \$1.06 \\ .10 \\ \hline \end{array}$ |
| 7. $\begin{array}{r} 368 \\ 58 \\ \hline \end{array}$ | 8. $\begin{array}{r} \$3.42 \\ .21 \\ \hline \end{array}$ | 9. $\begin{array}{r} \$4.80 \\ 3.00 \\ \hline \end{array}$ |
| 10. $\begin{array}{r} \$5.35 \\ .20 \\ \hline \end{array}$ | 11. $\begin{array}{r} 6 \text{ bu. } 2 \text{ pk.} \\ 4 \quad 1 \\ \hline \end{array}$ | 12. $\begin{array}{r} 27 \text{ gal.} \\ 9\frac{1}{2} \\ \hline \end{array}$ |

You have already found that to subtract 3 lb. 6 oz.
 a number like 14 oz. from 3 lb. 6 oz., you $\begin{array}{r} 14 \\ \hline \end{array}$
 may think of 2 lb. 22 oz. - 14 oz. = 2 lb. 8 oz. $\begin{array}{r} 2 \text{ lb. } 8 \text{ oz.} \\ \hline \end{array}$

WRITTEN EXERCISE

- 6 ft. 7 in. - 2 ft. 8 in.
- 7 lb. 4 oz. - 5 lb. 6 oz.
- 10 gal. 2 qt. - 6 gal. 3 qt.
- 12 bu. 2 pk. - 8 bu. 3 pk.
- $\$581.36 - \293.48 .
- $\$723.94 - \109.09 .
- Suppose you weigh 51 lb. 9 oz., and Frank weighs 56 lb. 3 oz., and the cat weighs 5 lb. 10 oz.; how much do the three weigh?
- Subtract the weight of the cat, and find how much you and Frank weigh. Prove your answer by adding your weight and Frank's.

MULTIPLICATION

ORAL EXERCISE

Write the numbers from 1 to 12 in miscellaneous order upon the blackboard. Change the order during the oral work. For example: 2, 7, 3, 10, 6, 9, 12, 4, 11, 8, 5.

1. Read the products by 2, 3, 4, and so on to 12, from left to right; from right to left.

2. Read the products by 2, with 4 added, thus: 8, 18, 10, and so on. In the same way, read the products by 3, 4, and so on to 12, with such numbers added as the teacher directs.

3. Read the product of each number multiplied by itself.

The class should frequently review the counting exercises and the tables of multiplication. Ex. 2 may be varied indefinitely.

WRITTEN EXERCISE

Multiply as indicated in Exs. 1-4:

1. \$2436 by 35.

2. \$4876 by 49.

3. \$5927 by 76.

4. \$8702 by 125.

5. How much is the rent of a village house per year, at \$27 per month?

6. How much is the rent of a city house per year, at \$83.33 per month?

7. How much more per month is the rent of the city house than the village house? also per year? Explain orally the reason for this difference in rent.

WRITTEN EXERCISE

Multiply as indicated in Exs. 1-8:

1. \$2942 by 245.
 2. \$3004 by 406.
 3. \$27.50 by 325.
 4. \$39.75 by 223.
 5. \$29.32 by 440.
 6. \$126.40 by 175.
 7. \$205.65 by 305.
 8. \$462.78 by 264.
9. How much does an 80-acre field in the country cost, at \$65 an acre?
10. How much does a 20-acre lot adjoining a village cost, at \$260 an acre?
11. How much does a city building lot 40 ft. on the front cost, at \$130 per front foot?
12. It is desired to purchase a strip of land 1 ft. wide and 40 ft. deep, so as to widen a lot for an office building in a city. How much will it cost, at \$130 a square foot?
13. A man has a farm of 160 acres. It cost him \$75.25 an acre. What was the total cost?
14. A man has a city lot of 125 front feet, costing him \$133.33 per front foot. How much did the lot cost?
15. A man bought a piece of land to add to his lot for a large city block. The piece was 18 ft. wide and 52 ft. deep, and he paid \$366.67 a square foot for it. How much did it cost?

The pupil should be asked to compare the sizes of these lots, and also to compare the answers. Without computing the exact differences, he should be asked to explain the reason for the great variations in value. The lots in Exs. 11 and 14 are 100 ft. deep.

ORAL EXERCISE

1. How much is 100 times \$0.15?
2. How much is 100 times \$1.25?
3. What is the short way of multiplying a number expressing United States money by 10? by 100?

To multiply by 10, move the decimal point one place to the right; to multiply by 100, move it two places.

Hence to multiply, for example, \$325.50 by 600, we may first multiply by 100, writing \$32,550 as the new multiplicand, and then we may multiply this by 6.

$$\begin{array}{r} \$32,550 \\ \times 6 \\ \hline \$195,300 \end{array}$$

If there are zeros in the multiplier, it is not necessary to write the products by zero. Thus,

Instead of writing all this:

Write only this:

$$\begin{array}{r} 426 \\ 305 \\ \hline 2130 \text{ product by } 5 \\ 0000 \text{ " " } 0 \text{ tens} \\ \hline 127800 \text{ " " } 300 \\ 129930 \text{ " " } 305 \end{array}$$

$$\begin{array}{r} 426 \\ 305 \\ \hline 2130 \\ 1278 \\ \hline 129930 \end{array}$$

WRITTEN EXERCISE

Multiply:

- | | |
|---------------------|---------------------|
| 1. \$6.25 by 400. | 2. \$8.25 by 600. |
| 3. \$48.25 by 700. | 4. \$62.50 by 500. |
| 5. \$36.75 by 800. | 6. \$29.35 by 900. |
| 7. \$285.75 by 400. | 8. \$823.30 by 600. |
| 9. \$981.03 by 200. | 10. \$6327 by 505. |
| 11. \$2835 by 805. | 12. \$2083 by 609. |

ORAL EXERCISE

1. Mollie has been sent to buy provisions at the baker's. She bought $\frac{1}{2}$ lb. of cake at 50 ct. a pound, and a dozen cream puffs at 25 ct. What did these cost?

2. What did she pay for six rolls at 10 ct. a dozen, and a pie at 15 ct.?

3. She bought a 10-ct. loaf of brown bread, and three 8-ct. loaves of whole wheat bread. What did these cost?

4. She handed the clerk \$1.25. How much change did she get?



WRITTEN EXERCISE

1. If the baker sells 36 doz. cookies at 10 ct. a dozen, and they cost him $7\frac{1}{2}$ ct. a dozen, how much does he make on the cookies?

2. If it costs the baker $3\frac{1}{2}$ ct. a loaf for the white bread, 6 ct. a loaf for the brown bread, and $5\frac{1}{2}$ ct. a loaf for the whole wheat bread, and he sells in a day 200 loaves of white bread at 5 ct., 15 of brown at 10 ct., and 20 of whole wheat at 8 ct., how much does he make?

FRACTIONS

ORAL EXERCISE

1. The fraction $\frac{1}{5}$ of a dollar means that \$1 has been divided into how many equal parts, and how many of these parts taken?

2. In the fraction $\frac{7}{5}$, what is the denominator? What does it tell about the fraction? What is the numerator? What does that tell?

3. The fraction $\frac{1}{4}$ shows that how many quarter dollars have been taken? How much is this? The fraction $\frac{3}{2}$ shows that how many half dollars have been taken? How much is this?

A fraction less than 1, like $\frac{3}{4}$, is called a *proper fraction*.

A fraction equal to or greater than 1, like $\frac{4}{4}$ or $\frac{3}{2}$, is called an *improper fraction*.

A number in which no fraction appears, like 2, 10, 56, is called a *whole number*, or an *integer*.

A number made up of an integer and a fraction, like $4\frac{2}{3}$, is called a *mixed number*.

WRITTEN EXERCISE




1. Write five fractions, five integers, and five mixed numbers.

2. Write five improper fractions equal to 1, and five greater than 1.

3. A boy earned $\$ \frac{1}{2}$ in one day, $\$ \frac{3}{4}$ the next day, and $\$ 1\frac{1}{4}$ during the next two days. How much did he earn in the four days?

REDUCTION OF FRACTIONS

ORAL EXERCISE

1. From A: $\frac{1}{2} = \frac{?}{8}$? $\frac{1}{3} = \frac{?}{8}$? $\frac{?}{8} = 1$? $\frac{1}{2}$ of $\frac{6}{8} = \frac{?}{8} = \frac{?}{2}$?
 2. From B: $\frac{1}{2} = \frac{?}{8}$? $\frac{1}{4} = \frac{?}{8}$?
 $\frac{?}{8} = 1$? $\frac{1}{2}$ of $\frac{8}{8} = \frac{?}{2}$?
 3. From C: $\frac{1}{6} = \frac{?}{10}$? $\frac{2}{6} = \frac{?}{10}$? $\frac{1}{2} = \frac{?}{10}$? $\frac{?}{10} = 1$? $\frac{?}{5} = 1$?
- 


- A
B
C
4. Express $\frac{1}{2}$ as fourths; as eighths; as sixths.
 5. Express $\frac{1}{3}$ as sixths; as ninths; $\frac{2}{3}$ as sixths.

Both terms of a fraction may be multiplied by the same number without changing the value of the fraction.

$$\text{Thus, } \frac{1}{2} = \frac{3 \text{ times } 1}{3 \text{ times } 2} = \frac{3}{6}.$$

Both terms of a fraction may be divided by the same number without changing the value of the fraction.

$$\text{Thus, } \frac{8}{10} = \frac{8 \div 2}{10 \div 2} = \frac{4}{5}.$$

When the terms of a fraction are divided by the same number, that number is said to be *canceled*.

When both terms cannot be divided by the same integer, the fraction is said to be *reduced to its lowest terms*.

$$\text{Thus, } \frac{8}{16} = \frac{4}{8} = \frac{2}{4} = \frac{1}{2}, \text{ its lowest terms.}$$

WRITTEN EXERCISE

1. Reduce to twelfths: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{6}$, $\frac{5}{6}$.
2. Reduce to sixteenths: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{3}{4}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{7}{8}$.
3. Reduce to lowest terms: $\frac{20}{30}$, $\frac{9}{12}$, $\frac{10}{10}$, $\frac{16}{20}$, $\frac{15}{30}$.

ORAL EXERCISE

1. How many half spheres in 1 sphere? in $1\frac{1}{2}$ spheres? in 2 spheres? in $2\frac{1}{2}$ spheres?
2. How many halves in 1? in $1\frac{1}{2}$? in 2? in 5? in $5\frac{1}{2}$? in 10? in 25? in 50?
3. How many fourths in 1? in $1\frac{1}{4}$? in $1\frac{1}{2}$? in $1\frac{3}{4}$? in $5\frac{3}{4}$? in 10? in 25? in 50?
4. Express as thirds: 8, 2, $3\frac{1}{3}$, 4, $5\frac{2}{3}$, 7, $10\frac{1}{3}$.
5. Express as fourths: 6, 8, $2\frac{1}{4}$, 5, $3\frac{3}{4}$, $8\frac{1}{4}$, 12.
6. Express as fifths: 9, 6, $4\frac{1}{5}$, $3\frac{2}{5}$, $8\frac{3}{5}$, $7\frac{4}{5}$, 11.
7. Express as sixths: 1, 6, $7\frac{1}{6}$, $8\frac{5}{6}$, 11, $10\frac{1}{6}$, 9.
8. Express as eighths: 10, 7, $6\frac{1}{8}$, $7\frac{3}{8}$, $9\frac{5}{8}$, $10\frac{7}{8}$.
9. Express as tenths: 1, 5, $2\frac{1}{10}$, 7, $3\frac{3}{10}$, 11.

Required to reduce $14\frac{5}{12}$ to twelfths.

$$\text{Since } 1 = \frac{12}{12}, 14 = \frac{14 \text{ times } 12}{12} = \frac{168}{12}.$$

$$\text{Adding, } \frac{168}{12} + \frac{5}{12} = \frac{173}{12}.$$

WRITTEN EXERCISE

Reduce:

- | | |
|----------------------------------|-----------------------------------|
| 1. 69 to eighths. | 2. 77 to ninths. |
| 3. 91 to sevenths. | 4. 96 to ninths. |
| 5. $98\frac{1}{2}$ to halves. | 6. 341 to tenths. |
| 7. $17\frac{1}{2}$ to fifths. | 8. $73\frac{3}{5}$ to fifths. |
| 9. $83\frac{2}{3}$ to thirds. | 10. $48\frac{2}{3}$ to thirds. |
| 11. $66\frac{5}{6}$ to sixths. | 12. $39\frac{3}{4}$ to fourths. |
| 13. $98\frac{3}{10}$ to tenths. | 14. $101\frac{3}{4}$ to fourths. |
| 15. $35\frac{2}{7}$ to sevenths. | 16. $67\frac{1}{12}$ to twelfths. |

ORAL EXERCISE

1. How many whole squares can you make from these 8 quarter squares? from 4 such quarter squares?

2. Then $\frac{3}{4}$ are how many units? $\frac{1}{4}$ are how many units? $\frac{5}{4} = 1 +$ how many fourths? $\frac{6}{4} = 1 +$ what fraction?

$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{4}$	$\frac{1}{4}$

$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{4}$	$\frac{1}{4}$

3. How many 2-ft. lengths in 10 ft.? How many times is \$2 contained in \$10? How many $\frac{2}{3}$ in $\frac{10}{3}$? How many $\frac{2}{3}$ in $\frac{10}{2}$? Then how many 1's in $\frac{10}{2}$? in $\frac{6}{2}$?

4. How many 2-ft. lengths in 5 ft.? How many $\frac{2}{3}$ in $\frac{5}{2}$? in $\frac{7}{2}$? How many 1's in $\frac{9}{2}$? in $\frac{11}{2}$?

5. Since $\frac{3}{3} = 1$, how many 1's in $\frac{27}{3}$? in $\frac{18}{3}$? in $\frac{18}{3}$? in $\frac{5}{3}$? in $\frac{7}{3}$? How many 1's in $\frac{5}{4}$? in $\frac{7}{4}$?

Required to reduce $\frac{39}{7}$ to a whole or a mixed number.

Since $\frac{7}{7} = 1$, $\frac{39}{7} =$ as many 1's as $39 \div 7$, or $5\frac{4}{7}$.

To reduce a fraction to a whole or a mixed number, divide the numerator by the denominator.

WRITTEN EXERCISE

Reduce to whole numbers:

1. $\frac{48}{4}$. 2. $\frac{96}{8}$. 3. $\frac{111}{3}$. 4. $\frac{75}{5}$. 5. $\frac{72}{6}$. 6. $\frac{108}{9}$.

Reduce to mixed numbers:

7. $\frac{82}{7}$. 8. $\frac{73}{9}$. 9. $\frac{57}{6}$. 10. $\frac{113}{2}$. 11. $\frac{97}{8}$. 12. $\frac{206}{11}$.

Reduce to whole or to mixed numbers:

13. $\frac{64}{4}$. 14. $\frac{87}{7}$. 15. $\frac{91}{11}$. 16. $\frac{181}{12}$. 17. $\frac{127}{20}$. 18. $\frac{113}{26}$.

ALiquot PARTS

WRITTEN EXERCISE

1. Multiply 246 by 5. Divide 2460 by 2. Compare the results.

2. Instead of multiplying by 5, you may annex how many ciphers and divide by what number?

3. Multiply 224 by 25. Divide 22,400 by 4. Compare the results.

4. Instead of multiplying by 25, you may annex how many ciphers and divide by what number?

Because $5 = 10 \div 2$, therefore, *to multiply by 5, annex a cipher and divide by 2.*

Because $25 = 100 \div 4$, therefore, *to multiply by 25, annex two ciphers and divide by 4.*

5. Divide 240 by 5. Multiply 24 by 2. Compare the results.

6. Instead of dividing by 5, you may cut off how many ciphers and multiply by what number?

7. Divide 300 by 25. Multiply 3 by 4. Compare the results.

8. Instead of dividing by 25, you may cut off how many ciphers and multiply by what number?

Therefore, *to divide tens by 5, cut off a cipher and multiply by 2.*

To divide hundreds by 25, cut off two ciphers and multiply by 4.

ORAL EXERCISE

Multiply as indicated in Exs. 1-12:

- | | | |
|---------------|---------------|---------------|
| 1. 86 by 5. | 2. 36 by 5. | 3. 28 by 5. |
| 4. 44 by 25. | 5. 84 by 25. | 6. 64 by 5. |
| 7. 64 by 25. | 8. 48 by 25. | 9. 88 by 25. |
| 10. 248 by 5. | 11. 202 by 5. | 12. 124 by 5. |

Divide as indicated in Exs. 13-18:

- | | | |
|---------------------|---------------------|---------------------|
| 13. $110 \div 5$. | 14. $210 \div 5$. | 15. $320 \div 5$. |
| 16. $600 \div 25$. | 17. $800 \div 25$. | 18. $500 \div 25$. |

An integer or mixed number that will exactly divide a number is called an *aliquot part* of that number.

For example, you have found (page 157) that

\$0.50 is $\frac{1}{2}$ of \$1, \$0.33 $\frac{1}{3}$ is $\frac{1}{3}$ of \$1,

\$0.25 is $\frac{1}{4}$ of \$1, \$0.20 is $\frac{1}{5}$ of \$1.

Therefore, \$0.50, \$0.25, \$0.33 $\frac{1}{3}$, \$0.20 are aliquot parts of \$1.00, and 5 is an aliquot part of 10. \$0.12 $\frac{1}{2}$ = $\frac{1}{8}$.

The term is unimportant, but is required in some courses.

WRITTEN EXERCISE

Multiply as indicated in Exs. 1-3:

1. 3133 by 5. 2. 387 by 25. 3. 7354 by 25.

Divide as indicated in Exs. 4-6:

4. $7070 \div 5$. 5. $8400 \div 25$. 6. $31,200 \div 25$.
7. At 5 ct. each, what will 147 pencils cost?
8. At 25 ct. each, what will 147 books cost?
9. If 5 ponies cost \$430, what will 1 cost?
10. If 25 pianos cost \$7100, what will 1 cost?

ADDITION OF FRACTIONS

ORAL EXERCISE

1. Add: $4\frac{1}{2} + 3\frac{1}{2}$, $6\frac{1}{3} + 7\frac{2}{3}$, $5\frac{2}{3} + 7\frac{2}{3}$, $4\frac{1}{5} + 5\frac{4}{5}$.
2. Add: $\frac{1}{4} + \frac{1}{2}$, $\frac{1}{3} + \frac{1}{6}$, $\frac{1}{4} + \frac{3}{8}$, $\frac{1}{5} + \frac{1}{10}$ or $\frac{2}{10} + \frac{1}{10}$.
3. Add: $\frac{1}{4} + \frac{2}{4}$, $\frac{2}{8} + \frac{4}{8}$, $\frac{1}{4} + \frac{1}{2}$. To add $\frac{1}{4}$ and $\frac{1}{2}$, should we think of both as fourths or as eighths?

You have found that *to add fractions they should be reduced to fractions having a common denominator.*

In Ex. 3 you found that it is better to reduce to fractions having the *least common denominator* (l.c.d.).

$$\begin{array}{r} 3\frac{3}{4} = 3\frac{9}{12} \\ 7\frac{5}{6} = 7\frac{10}{12} \\ \hline 10\frac{19}{12} = 11\frac{7}{12} \end{array}$$

Because the denominators are 4 and 6, the l.c.d. must contain

$$4 = 2 \times 2$$

and

$$6 = 2 \times 3,$$

and therefore two 2's and a 3. Therefore,

$$\text{the l.c.d.} = 2 \times 2 \times 3 = 12.$$

We also see that $\frac{3}{4} = \frac{9}{12}$, $\frac{5}{6} = \frac{10}{12}$. (See page 223.)

WRITTEN EXERCISE

1. $\frac{1}{8} + \frac{3}{8}$.
2. $\frac{2}{3} + \frac{4}{3}$.
3. $\frac{2}{5} + \frac{1}{2}$.
4. $2\frac{5}{6} + 4\frac{1}{3}$.
5. $3\frac{1}{4} + 5\frac{1}{3}$.
6. $4\frac{2}{3} + 3\frac{1}{6}$.
7. $2\frac{3}{4} + 4\frac{1}{3}$.
8. $3\frac{1}{5} + 2\frac{1}{10}$.
9. $7\frac{1}{4} + 6\frac{1}{8}$.
10. If a man paid $\$3\frac{3}{4}$ for a hat and $\$16\frac{1}{2}$ for a coat, how much did he pay for both?
11. A man bought 3 cows for $\$100$. He sold one for what it cost, another for $\$35\frac{1}{2}$, and the third for $\$42\frac{3}{4}$. How much did he receive for all?

SUBTRACTION OF FRACTIONS

ORAL EXERCISE

1. Subtract: $\frac{3}{4} - \frac{1}{4}$, $\frac{2}{3} - \frac{1}{3}$, $\frac{5}{6} - \frac{1}{6}$, $\frac{7}{8} - \frac{5}{8}$.
2. Subtract: $4\frac{3}{4} - 2\frac{1}{4}$, $7\frac{2}{3} - 4\frac{1}{3}$, $18\frac{5}{6} - 8\frac{1}{6}$, $25\frac{1}{3} - 5\frac{2}{3}$.
3. From $\$5\frac{3}{4}$ subtract $\$1\frac{1}{4}$; then subtract $\$2\frac{1}{2}$; then $\$2\frac{1}{2}$.
4. From 10 ft. 6 in. subtract 6 ft. 4 in. From $10\frac{6}{7}$ subtract $6\frac{4}{7}$.
5. In order to subtract fractions, what should you do with their denominators?

To subtract one fraction from another, they should be reduced to fractions having the least common denominator.

How much is $426\frac{3}{4} - 125\frac{1}{4}$?

The l.c.d. of the fractions is 12, for this is the smallest number that contains 3 and 4. We see (page 223) that $\frac{3}{4} = \frac{9}{12}$, and $\frac{1}{4} = \frac{3}{12}$. We then subtract as shown on page 180.

$$\begin{array}{r} 426\frac{3}{4} = 426\frac{9}{12} \\ 125\frac{1}{4} = 125\frac{3}{12} \\ \hline 301\frac{6}{12} \end{array}$$

WRITTEN EXERCISE

Subtract in Exs. 1-9:

1. $48\frac{1}{2} - 30\frac{1}{3}$.
2. $625\frac{1}{5} - 72\frac{1}{3}$.
3. $833\frac{1}{3} - 66\frac{2}{3}$.
4. $112\frac{1}{3} - 89\frac{1}{3}$.
5. $105\frac{1}{3} - 92\frac{2}{3}$.
6. $69\frac{1}{4} - 67\frac{1}{4}$.
7. $245\frac{5}{12} - 45\frac{1}{4}$.
8. $312\frac{5}{6} - 121\frac{1}{2}$.
9. $48\frac{1}{7} - 21\frac{1}{2}$.
10. A man bought some property for $\$92\frac{7}{8}$, and sold it for $\$105\frac{1}{8}$. How much did he gain?
11. How much would he have gained if he had sold it for $\$106\frac{1}{2}$?

ORAL EXERCISE

1. If Kate used $\frac{1}{2}$ lb. of sugar at 6 ct. a pound, 7 lemons at 2 ct. each, and a 4-ct. orange for the lemonade at her party, what did it cost?



2. At 40 ct. a quart, how much did 3 pt. of ice cream cost?

3. At $\frac{1}{2}$ lb. to the cup, what did 2 cups of sugar for the cake cost, at 6 ct. a pound?

4. At 18 ct. a dozen, what did 4 eggs for the cake cost?

5. For icing the cake, 1 egg and 1 cup of sugar were used. How much were these worth at the prices given?

6. Write all these items on the board and tell what Kate's party cost.

ORAL EXERCISE

1. If A is called 1, point to $\frac{1}{2}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{4}{5}$.

2. Point to $\frac{1}{2}$ of $\frac{4}{5}$. How much is it?

3. Point to $\frac{1}{4}$ of $\frac{4}{5}$. How much is it?

4. Point to $\frac{1}{3}$ of $\frac{3}{4}$. How much is it?

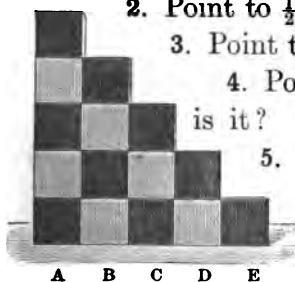
5. If B is called 1, point to $1\frac{1}{4}$; $\frac{3}{4}$; $\frac{1}{2}$; $\frac{1}{4}$.

6. Point to $\frac{1}{5}$ of $1\frac{1}{4}$. How much is it?

7. Point to $\frac{1}{2}$ of $\frac{1}{2}$. How much is it?

8. Using blocks or strips of paper or pictures, show that $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{6}$, and $\frac{1}{3}$ of $\frac{1}{2}$ is $\frac{1}{6}$.

9. Show that $\frac{2}{3}$ of $\frac{1}{2}$ is $\frac{1}{3}$, and that $\frac{2}{3}$ of $\frac{3}{4}$ is $\frac{1}{2}$.



WRITTEN EXERCISE

1. Draw a line 1 in. long and divide it into eighths.

2. Looking at this line, find $\frac{1}{2}$ of $\frac{3}{4}$ and write its value.

3. Looking at it again, find $\frac{1}{2}$ of $\frac{2}{4}$ and write its value.

In the same way, write the values of:

4. $\frac{1}{4}$ of $\frac{1}{2}$.

5. $\frac{1}{3}$ of $\frac{3}{4}$.

6. $\frac{1}{5}$ of $\frac{5}{8}$.

7. $\frac{2}{3}$ of $\frac{5}{8}$.

8. $\frac{3}{4}$ of $\frac{1}{2}$.

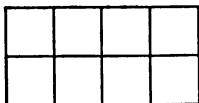
9. $\frac{1}{7}$ of $\frac{7}{8}$.

10. Show that $\frac{1}{2}$ of $\frac{1}{3}$ in. = $\frac{1}{3}$ of $\frac{1}{2}$ in.

11. Show that $\frac{1}{3}$ of $\frac{1}{5}$ of a 15-in. line is the same as $\frac{1}{5}$ of $\frac{1}{3}$ of the line.

ORAL EXERCISE

1. Point to $\frac{1}{2}$ of the rectangle; to $\frac{1}{4}$; to $\frac{1}{8}$; to $\frac{3}{4}$.



2. How many $\frac{1}{4}$'s in $\frac{1}{2}$? in $\frac{3}{4}$?
in 1?

3. How many $\frac{1}{8}$'s in $\frac{1}{4}$? in $\frac{1}{2}$?
in $\frac{3}{4}$? in 1?

4. Show that $\frac{1}{4}$ is $\frac{1}{2}$ of $\frac{1}{2}$. In the same way,
 $\frac{1}{8}$ is what part of $\frac{1}{4}$?

5. Show that $\frac{3}{4}$ is 6 times $\frac{1}{8}$. In the same way,
 $\frac{3}{4}$ is how many times $\frac{1}{4}$? how many times $\frac{1}{2}$?

6. At 6 for a dime, what will $1\frac{1}{2}$ doz. eggs cost?

7. At a quarter of a dollar each, how many balls
can I buy for half a dollar?

8. If we can buy 8 tablets for \$1, how many
can we buy for 50 ct.? for 25 ct.? for 75 ct.?

9. When eggs are a quarter of a dollar a dozen,
how many dozen can be bought for \$1.50? for
\$1.25?

WRITTEN EXERCISE

1. Draw a rectangle twice as long as the one
above, but with the same width, and divide it into
16 equal squares.

2. Look at it, and write the answers to these
questions:

1. $\frac{1}{16}$ is what part of $\frac{1}{8}$? of $\frac{1}{4}$? of $\frac{1}{2}$?

2. How many times is $\frac{1}{16}$ contained in 1?
in $\frac{1}{8}$? in $\frac{1}{4}$?

3. How many times $\frac{1}{16}$ is $\frac{5}{8}$? $\frac{3}{8}$? 1? $\frac{1}{2}$?

ORAL EXERCISE

1. What number does $\frac{3}{2}$ equal? $\frac{10}{2}$? $\frac{12}{2}$? $\frac{24}{2}$?
2. At $\$ \frac{1}{2}$ a yard, what is the cost of 8 yd. of cloth? of 10 yd.? of 16 yd.? of 24 yd.?
3. At $\$ \frac{1}{3}$ a yard, what is the cost of 6 yd. of cloth? of 12 yd.? of 15 yd.? of 30 yd.?
4. How much will 24 yd. of cloth cost at 50 ct. a yard? at $33\frac{1}{3}$ ct. a yard?

You have seen that 30 times 50 ct. is the same as 30 times $\$ \frac{1}{2}$, or $\$ \frac{20}{2}$, or \$15. Also that 30 times $33\frac{1}{3}$ ct. is the same as 30 times $\$ \frac{1}{3}$, or \$10.

In the same way,

$$60 \text{ times } 25 \text{ ct.} = 60 \text{ times } \$ \frac{1}{4} = \$ \frac{60}{4} = \$15.$$

$$60 \text{ times } 20 \text{ ct.} = 60 \text{ times } \$ \frac{1}{5} = \$ \frac{60}{5} = \$12.$$

5. What is the cost of 35 doz. eggs at 20 ct. a dozen?
6. What is the cost of 84 doz. oranges at 50 ct. a dozen?
7. What is the cost of 88 brooms at 25 ct. each? at 50 ct. each?
8. What is the cost of 15 doz. pencils at 3 doz. for a dollar?
9. How much would your school have to pay for 25 boxes of crayons at 20 ct. a box?
10. How much would it have to pay for 60 readers at $33\frac{1}{3}$ ct. each? for 40 at 25 ct. each?
11. How much would it have to pay for 4 maps at 50 ct. each? at \$3 each? at \$3.50 each?

ORAL EXERCISE

1. How much will 12 yards of silk cost at $\$ \frac{1}{2}$ a yard? at \$1 a yard? at \$1.50 a yard?
2. How much will 15 yards of silk cost at $\$ \frac{1}{3}$ a yard? at \$1 a yard? at $\$1.33\frac{1}{3}$ a yard?
3. How much will 15 doz. small dolls cost at $\$ \frac{1}{5}$ a dozen? at \$1 a dozen? at \$1.20 a dozen?
4. How much will 16 things cost at $\$ \frac{1}{4}$ each? at \$1 each? at \$1.25 each?

You have found that the cost of things at

\$1.50 each is the cost at \$1 + half as much more;
\$1.33 $\frac{1}{3}$ each is the cost at \$1 + a third as much more;
\$1.25 each is the cost at \$1 + a fourth as much more;
\$1.20 each is the cost at \$1 + a fifth as much more.

For example, at \$1.25 a dozen, a dealer would pay for 12 doz. boxes of candy $\$12 + \frac{1}{4}$ of \$12, or \$15.

WRITTEN EXERCISE

1. How much will 136 hats cost at \$1.25 each?
2. How much will 148 croquet sets cost at \$1.20 a set?
3. How much will 250 tennis rackets cost at \$1.50 each?
4. How much will 96 pairs of shoes cost at $\$1.33\frac{1}{3}$ a pair?
5. If certain books cost a dealer at the rate of \$1.25 apiece, how much must he pay for 132 such books?

ORAL EXERCISE

Copy these numbers on the blackboard and add:

4	5	6	7
4 4	5 5	6 6	7 7
4 4 4	5 5 5	6 6 6	7 7 7
<u>4 4 4 4</u>	<u>5 5 5 5</u>	<u>6 6 6 6</u>	<u>7 7 7 7</u>

Point to the columns representing the following numbers, and tell the sums in all cases:

1. 10, $\frac{1}{2}$ of 10, $\frac{3}{4}$ of 10.
2. 15, $\frac{1}{3}$ of 15, $\frac{2}{3}$ of 15.
3. 14, $\frac{1}{2}$ of 14, $\frac{3}{4}$ of 14, $\frac{1}{4}$ of 14.
4. 21, $\frac{1}{3}$ of 21, $\frac{2}{3}$ of 21, $\frac{1}{3}$ of 21.
5. 28, $\frac{1}{4}$ of 28, $\frac{3}{4}$ of 28, $\frac{1}{2}$ of 28, $\frac{1}{4}$ of 28.
6. 12, $\frac{3}{4}$ of 12, $\frac{1}{4}$ of 12, $\frac{1}{2}$ of 12.
7. 8, $\frac{1}{2}$ of 8, $\frac{3}{4}$ of 8, $\frac{1}{4}$ of 8.
8. 10, $1\frac{1}{2}$ times 10; 12, $1\frac{1}{2}$ times 12.
9. 18, $1\frac{1}{3}$ times 18, $\frac{1}{3}$ of 18, $\frac{2}{3}$ of 18.

WRITTEN EXERCISE

1. At $12\frac{1}{2}$ ct. a yard, how much will 7 yd. of cloth cost?
2. If the cloth costs $2\frac{1}{2}$ ct. a yard more, how much will the 7 yd. cost?
3. If the cloth can be bought for 15 ct. a yard, and it is found that we need only $6\frac{1}{3}$ yd., how much will it cost?
4. How much would $6\frac{2}{3}$ yd. cost at 18 ct. a yard?

WRITTEN EXERCISE

1. $26\frac{1}{3} - 17\frac{1}{4}$. 2. $33\frac{1}{3} - 16\frac{2}{3}$. 3. $21\frac{4}{5} - 16\frac{1}{2}$.
4. $\$4\frac{3}{8} + \$5\frac{1}{2}$. 5. $\$6\frac{1}{4} + \$7\frac{1}{8}$. 6. $\$5\frac{1}{2} + \$6\frac{2}{3}$.
7. $26\frac{4}{5} + 18\frac{1}{8}$. 8. $42\frac{5}{12} - 29\frac{5}{8}$. 9. $53\frac{5}{16} - 28\frac{1}{8}$.
10. $28\frac{1}{10} - 19\frac{4}{5}$. 11. $45\frac{2}{15} - 26\frac{2}{3}$. 12. $45\frac{2}{15} - 18\frac{1}{3}$.
13. $\frac{7}{8}$ in. + $2\frac{1}{4}$ in. 14. $1\frac{2}{3}$ ft. + $\frac{1}{2}$ ft. 15. $2\frac{7}{8}$ in. + $\frac{3}{4}$ in.
16. A man bought $62\frac{3}{4}$ lb. of maple sugar, and sold $8\frac{1}{2}$ lb., $5\frac{7}{8}$ lb., $6\frac{3}{4}$ lb. How much had he left?
17. A man bought $4\frac{1}{4}$ doz. eggs, $6\frac{1}{3}$ doz., $5\frac{1}{2}$ doz., and $3\frac{3}{4}$ doz. He then sold $12\frac{3}{4}$ doz. and 2 doz. How many had he left?
18. What are 40 eggs worth at 15 ct. a dozen?
19. What are 20 oranges worth at 45 ct. a dozen?
20. What will 8 yd. of cloth cost at $\$ \frac{3}{4}$ a yard?
21. $\frac{1}{4}$ of 48, $\frac{3}{4}$ of 48. 22. $\frac{1}{5}$ of 60, $\frac{4}{5}$ of 60.
23. $\frac{1}{6}$ of 42, $\frac{5}{6}$ of 42. 24. $\frac{1}{7}$ of 42, $\frac{3}{7}$ of 42.
25. $\frac{1}{8}$ of 64, $\frac{3}{8}$ of 64. 26. $\frac{1}{9}$ of 27, $\frac{5}{9}$ of 27.
27. $\frac{5}{8}$ of 36 in.; of 48 in. 28. $\frac{2}{3}$ of \$63; of \$81.
29. $\frac{5}{8}$ of 72 yd.; of 96 rd. 30. $\frac{2}{5}$ of 35 ft.; of 75 in.
31. If I need 56 ft. of picture molding for one room and $\frac{7}{8}$ as much for another, how much do I need for both?
32. If John's father buys 3 qt. of one kind of lawn grass seed, and $2\frac{1}{2}$ times as much of another kind, how many quarts has he of both?
33. If one room takes 27 yd. of carpet, and another $\frac{2}{3}$ as much, and a third $\frac{1}{3}$ as much as the first two together, how much is required for all?

BILLS AND RECEIPTS

What do people mean when they say they have an account at a store? What is meant by presenting a bill for goods purchased? What is meant by receipting a bill? How is it done?

In the bill given below the symbol @ means *at*. For example, 2 doz. eggs @ 30¢ \$0.60 means that 2 doz. eggs at 30 ct. a dozen cost 60 ct.

To *fill a bill* means to write the cost of each item.

To *foot a bill* means to add and find the total cost.

Dr. means *debtor*, and in the bill below it means that David Brownson is in debt to Jewett & Glover.

New York, January 21, 1905.

Mr. David Brownson,

642 West 88th St., New York.

To Jewett & Glover,

Dealers in Groceries, 535 West 80th St., Dr.

		\$	ct.
Jan. 5.	6 cans Soup @ 10¢		60
	4 lb. Butter @ 28¢	1	12
	6 lb. Brown Sugar @ 5¢		30
" 9.	5 lb. Coffee @ 32¢	1	60
" 11.	10 lb. Sugar @ 6¢		60
		4	22

Recd. payment,

Jewett & Glover.

WRITTEN EXERCISE

Copy, fill, foot, and receipt each of the following bills. Date the bills, put in the name, business, and address of some dealer you know, make the bills against yourself, and insert your address and the name of the place where you live.

1.

[Name of place, and date].....19.....

M.....[Mr. or Miss. Insert your name].....[Give your address]

To.....[Insert name of some grocer]....., Grocer,

.....[Give his address]..... Dr.

.....[Date]..... 2 lb. Powdered Sugar @ $7\frac{1}{2}\text{¢}$ \$.....
 " 2 doz. Eggs @ 25¢
 " $\frac{1}{2}$ doz. Oranges @ 60¢

[Receipt].....\$.....

2.

[Name of place, and date].....19.....

M.....[Name].....[Give your address]

Bought of.....[Name]....., Grocer,.....[Give his address]

.....[Date]..... 2 heads of Lettuce @ 5¢ \$.....
 " 3 lb. Butter @ 32¢
 " 2 gal. Oil @ 18¢
 " 4 lb. Raisins @ $12\frac{1}{2}\text{¢}$
 " 2 lb. Coffee @ $27\frac{1}{2}\text{¢}$

[Receipt].....\$.....

3.

[Name of place, and date].....19.....

M.....[Name].....

To.....[Name]....., Dealer in Meats and Poultry, Dr.

.....[Date]..... 5 lb. Roast Beef @ 16¢\$.....

" 4 lb. Chicken @ 22½¢\$.....

" 6½ lb. Lamb @ 20¢\$.....

[Receipt].....\$.....

4.

[Name of place, and date].....19.....

.....[Name of your school].....

To.....[Name].....,

Stationer and Bookseller, Dr.

.....[Date]..... 40 Arithmetics @ 35¢\$.....

" 3 doz. Tablets @ 50¢\$.....

" 8 doz. Pencils @ 35¢\$.....

[Receipt].....\$.....

5.

[Name of place, and date].....19.....

M.....[Name].....

Bought of.....[Name]....., Dealer in Dry Goods.

.....[Date]..... 2½ yd. Flannel @ \$1.00\$.....

" 3½ yd. Braid @ 12¢\$.....

" 10 yd. Embroidery @ 12½¢\$.....

" 2 yd. Taffeta Silk @ 85¢\$.....

[Receipt].....\$.....

The teacher should encourage the pupils to inquire outside of school about prices, so as to make out real bills of goods as they may be purchased in the place where they live.

WRITTEN EXERCISE

Find the cost of each of the following:

1. 2 lb. tea @ $62\frac{1}{2}\text{¢}$.
2. $3\frac{5}{8}$ lb. fish @ 16¢ .
3. $1\frac{3}{4}$ lb. tea @ 48¢ .
4. $\frac{3}{4}$ lb. cocoa @ 64¢ .
5. $2\frac{3}{4}$ lb. cake @ 32¢ .
6. $6\frac{3}{4}$ lb. figs @ 16¢ .
7. $2\frac{3}{4}$ lb. dates @ 8¢ .
8. $2\frac{1}{2}$ lb. cereal @ 8¢ .
9. $2\frac{1}{2}$ lb. coffee @ 30¢ .
10. $4\frac{1}{2}$ lb. starch @ 8¢ .
11. $\frac{3}{4}$ lb. pepper @ 32¢ .
12. $6\frac{7}{8}$ lb. prunes @ 8¢ .
13. $1\frac{7}{8}$ lb. cheese @ 16¢ .
14. 8 yd. cloth @ $37\frac{1}{2}\text{¢}$.
15. $1\frac{3}{4}$ pt. catsup @ 20¢ .
16. $2\frac{1}{2}$ pt. sirup @ 22¢ .
17. $5\frac{3}{8}$ lb. raisins @ 32¢ .
18. $\frac{3}{4}$ lb. mustard @ 28¢ .
19. $3\frac{1}{2}$ lb. steak @ 18¢ .
20. $8\frac{3}{8}$ lb. roast beef @ 16¢ .
21. $4\frac{3}{4}$ lb. chops @ 16¢ .
22. $1\frac{1}{2}$ lb. chocolate @ 40¢ .
23. 12 yd. calico @ $12\frac{1}{2}\text{¢}$.
24. $3\frac{1}{8}$ qt. pickles @ 48¢ .
25. $3\frac{1}{2}$ lb. walnuts @ 16¢ .
26. $3\frac{1}{2}$ lb. cocoanut @ 18¢ .
27. $1\frac{1}{2}$ lb. crackers @ 22¢ .
28. $6\frac{2}{3}$ lb. mackerel @ 18¢ .
29. $\frac{3}{4}$ gal. olive oil @ \$2.80.
30. $2\frac{1}{2}$ lb. cornstarch @ 10¢ .
31. $12\frac{1}{4}$ lb. bag of flour @ 4¢ .
32. $\frac{3}{4}$ lb. baking powder @ 42¢ .
33. $5\frac{2}{3}$ lb. dried apricots @ 18¢ .
34. 35 cakes of soap @ 60 for \$3.
35. 12 oz. almonds @ 32¢ a pound.
36. $2\frac{3}{4}$ lb. crystallized ginger @ 32¢ .
37. $2\frac{1}{2}$ qt. of chowchow @ 92¢ a gallon.
38. $\frac{1}{2}$ lb. gelatin @ 9¢ per 2-oz. package.

ORAL EXERCISE

1. These girls buy 6 cans of tomatoes at 2 cans for a quarter. What do they cost?

2. What do 3 lb. of coffee cost at 33 ct. a pound?

3. They buy $\frac{3}{4}$ lb. of Oolong tea at 48 ct. a pound. What does that cost?

4. They buy $1\frac{1}{2}$ lb. of cocoa. This is 56 ct. a pound. What does it cost?

5. They buy $\frac{1}{2}$ lb. of allspice at 20 ct. a pound, and $\frac{1}{2}$ lb. of cinnamon at 40 ct. a pound. What do these cost?

6. They also buy $\frac{1}{2}$ lb. of cheese at 16 ct. a pound, and $1\frac{1}{2}$ lb. of butter at 30 ct. a pound. How much do they pay for both?



WRITTEN EXERCISE

1. Make out a bill for the above purchases, filling it out, footing it, and receipting it.

2. They find that sirup costs 29 ct. a quart, or 95 ct. a gallon. If they wish 4 qt., how much will they gain by buying at the gallon rate?

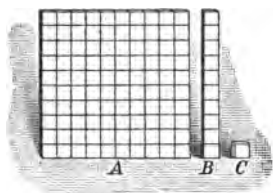
DECIMAL FRACTIONS

ORAL EXERCISE

1. How many dimes make \$1? Then 1 dime is what part of \$1? That is, \$0.10 is what part of \$1?

2. How many cents make \$1? Then 1 cent is what part of \$1? That is, \$0.01 is what part of \$1?

Teachers should show that just as \$0.10 is $\frac{1}{10}$ of a dollar, so .10 ft. is $\frac{1}{10}$ of a foot, .10 mi. is $\frac{1}{10}$ of a mile, and so on. Also that as \$0.01 is $\frac{1}{100}$ of a dollar, so .01 yd. is $\frac{1}{100}$ of a yard.



3. In the picture, if B is 1, what is A? C?

4. If C is 1, what is B? A?

5. If A is 1, what is B? C?

6. If we write A as 1, how may we write B, besides $\frac{1}{10}$? also C, besides $\frac{1}{100}$?

We write 0.1, or merely .1, for $\frac{1}{10}$,
 0.01, " " .01, " $\frac{1}{100}$,
 and 0.001, " " .001, " $\frac{1}{1000}$.

We also write 0.5, or .5, for $\frac{5}{10}$; 0.35, or .35, for $\frac{35}{100}$; and 3.425 for $3\frac{425}{1000}$.

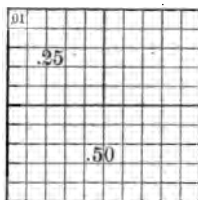
Fractions like .5, .35, and .125 are called *decimal fractions*.

Fractions like $\frac{1}{2}$, $\frac{3}{4}$, $\frac{9}{11}$, where the denominators are written, are called *common fractions*.

ORAL EXERCISE

1. In the picture point to .01 of the large square ; to .25 ; to .50 ; to .05 ; to .10.

2. The large square is how many fourths of itself ? how many thirds of itself ? how many tenths of itself ? how many hundredths of itself ?



3. Show from the picture that $.25 = \frac{1}{4}$. In the same way, $.75 =$ how many fourths ? $.10 =$ how many tenths ? $.05 =$ how many twentieths ?

4. Study the picture and name other fractions to which the following are equal :

.02 .04 .20 .40 .60 .80

5. Study the picture and name the decimal fractions to which these fractions are equal :

$\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{10}$ $\frac{1}{20}$ $\frac{1}{25}$ $\frac{1}{50}$
 $\frac{2}{4}$ $\frac{2}{5}$ $\frac{2}{5}$ $\frac{2}{5}$ $\frac{2}{10}$ $\frac{7}{10}$ $\frac{2}{20}$

WRITTEN EXERCISE

1. Draw a square $\frac{1}{8}$ in. on a side, and separate each side into tenths. Draw parallel lines dividing the square into hundredths, as in the picture above. Shade $\frac{1}{5}$ of it, so as to show that $\frac{1}{5} = .20 = \frac{2}{10} = .2$.

2. Draw another square like this and shade $33\frac{1}{3}$ of the small squares, so as to show that $\frac{1}{3} = .33\frac{1}{3}$, and that $\frac{2}{3} = .66\frac{2}{3}$.

ORAL EXERCISE

1. To what other common fraction is $\frac{5}{10}$ equal? Then express .5 as a common fraction.
2. To what other common fraction is $\frac{25}{100}$ equal? Then express .25 as a common fraction.
3. How much is .25 of 100? of 200? of 400?
4. Of 200 pupils in a certain school, .25 are less than 12 years old. How many such are there?

The name *common fraction* refers to the way in which the fraction is written. Thus, $\frac{5}{10}$ is a common fraction, although it is only another way of writing the decimal fraction .5.

You now see why the period (.) after dollars, as in \$2.50, is called a decimal point. It separates the decimal fraction from the dollars.

In the number 21,345.789, we have

Periods									
Thousands			Units			Thousandths			

ORAL EXERCISE

1. Express $\frac{4}{10}$ as fifths. Then $.4 =$ how many fifths?

2. Express $\frac{6}{10}$ as fifths. Then $.6 =$ how many fifths?

3. Express $\frac{8}{10}$ as fifths. Then $.8 =$ how many fifths?

4. How many 50's in .100? Then express $\frac{50}{100}$ as halves.

5. Because $\frac{5}{10} = \frac{1}{2}$, and $\frac{50}{100} = \frac{1}{2}$, what can you say about .5 and .50?

Annexing a zero to a decimal fraction does not change its value.

Because $\frac{3}{10} = \frac{30}{100}$, we see that $.3 = .30$.

To reduce a decimal fraction to a common fraction, write the denominator; then reduce to lowest terms.

That is, $.5 = \frac{5}{10}$, which we see equals $\frac{1}{2}$; and $.3 = \frac{3}{10}$, $.7 = \frac{7}{10}$, $.25 = \frac{25}{100}$, which is $\frac{1}{4}$.

WRITTEN EXERCISE

1. Express $\frac{1}{2}$ as tenths; then write it as a decimal fraction. Express $\frac{1}{2}$ as tenths; then write it as a decimal fraction.

2. Write as decimal fractions:

$\frac{7}{10}$ $\frac{3}{5}$ (or $\frac{6}{10}$) $\frac{4}{5}$ $\frac{9}{10}$ $\frac{1}{10}$

3. Write as common fractions:

.1 .5 .2 .25 .50 .75

ORAL EXERCISE

1. Add \$1.20 and \$2.10; also 1.20 and 2.10.
2. Add \$1.50 and \$3; also 1.5 and 3.
3. Add \$4.75 and \$0.25; also 4.75 ft. and .25 ft.
4. Add \$1.30 and \$1.20; also 1.3 yd. and 1.2 yd.
5. From \$2.50 take \$1.25; also from 2.50 mi. take 1.25 mi.

You have seen that you add and subtract decimal fractions as you do United States money.

Required to add 2.25, 3.2, and 4. 2.25

Just as we write the decimal points in a column 3.2
 in adding money, so we do with decimal fractions, 4.
 to add like numbers to one another. 9.45

The reasons for such operations can appear clear to pupils only through the efforts of the teacher. A text-book can give merely a hint.

Required to subtract 4.25 from 8.2. 8.20

Since $\frac{2}{10}$ is the same as $\frac{20}{100}$, the 8.2 may be 4.25
 written 8.20. We may then subtract, as with 3.95
 United States money.

WRITTEN EXERCISE

1. $3.2 + 4.8 + 5.05$.
2. $6.4 + 9.35 + 8.2$.
3. $28.42 + 62.4 + 3.9$.
4. $7.48 + 5.48 + 6.08$.
5. $39.45 - 26.25$.
6. $47.35 - 25.05$.
7. $342.8 - 121.65$.
8. $423.45 - 68.125$.
9. If a table top is 3.25 ft. long and 1.25 ft. wide, what is the distance around it?

ORAL EXERCISE

1. How many 10's in 50? How much is $\frac{1}{10}$ of 50? $\frac{10}{100}$ of 50? .10 of 50?

2. How much is $\frac{1}{100}$ of 200? Then how much is $\frac{12}{100}$ of 200? .12 of 200? .11 of 200?

You have seen that to take .25 of a number you may first take .01 and then multiply by 25.

To take .01 of a number like \$350, we	\$350
have seen that $\frac{\$350}{100} = \3.50 . That is, in	\$3.50
	<u>25</u>
\$350.00 we move the decimal point two	1750
places to the left.	<u>700</u>

That is, .25 of \$350 is found in this way:

1. .01 of \$350 = \$3.50.
2. 25 times \$3.50 = \$87.50.

WRITTEN EXERCISE

Multiply in Exs. 1-6:

- | | |
|------------------|---------------------------------|
| 1. \$400 by .20. | 2. \$300 by .75. |
| 3. \$125 by .35. | 4. \$250 by .25. |
| 5. \$425 by .30. | 6. \$630 by .33 $\frac{1}{3}$. |
7. In a certain school of 250 pupils, .40 of the pupils were boys. How many were boys?
8. If Jack had 84 marbles and lost .25 of them, how many did he lose?
9. If Carrie invited 30 to her party and .10 of them could not come, how many remained away?

REVIEW OF DENOMINATE NUMBERS

ORAL EXERCISE

1. Give the table of time.
2. Give the table of dry measure.
3. Give the table of liquid measure.
4. Give the table of United States money.
5. Give the table of length; of square measure; of cubic measure.

The teacher should frequently call for the facts of the various tables, as well as the tables themselves. There are advantages in both of these forms of drill work. The tables should now be thoroughly known.

WRITTEN EXERCISE

1. Write the table of weight.
2. Write the tables of dry and liquid measure.
3. Write the tables of square and cubic measure.
4. Write the table of time, and the names of the months having 30 days each.
5. At 70 ct. a square foot, how much will a tile floor cost that is 3 yd. wide and 4 yd. long?
6. If a man gets 40 ct. an hour for laying the floor, and he works 2 days at 8 hr. a day, how much does he receive?
7. Draw a plan of the floor mentioned in Ex. 5, on a scale of 1 in. to the yard. Then measure the number of yards from one corner to the opposite one. (The distance should equal 15 ft.)

ORAL EXERCISE

1. How many square inches are there in 1 sq. ft.?
in 1 sq. ft. 16 sq. in.?
2. How many square feet are there in 1 sq. yd.?
in 2 sq. yd.? in 2 sq. yd. 3 sq. ft.?
3. How far is it around a square that is 5 ft. on
a side? What is the area of the square?
4. How long is the side of a square which is
36 yd. around? of one which is 40 ft. around?

You already know that 144 sq. in. = 1 sq. ft., and
9 sq. ft. = 1 sq. yd. You should now learn that

$$\begin{array}{rcl} 160 \text{ square rods} & = & 1 \text{ acre (A.).} \\ 640 \text{ acres} & & = 1 \text{ square mile.} \end{array}$$

5. If a street is 4 rd. wide, and you mark off
40 rd. in length, how many acres in this part?
6. How many acres in a street 4 rd. wide and
80 rd. long? 4 rd. wide and 20 rd. long?

WRITTEN EXERCISE

1. How many square rods in $17\frac{1}{2}$ A.?
2. How many acres in 43 sq. mi.? in 100 sq. mi.?
3. A man has a garden 32 rd. long and 15 rd.
wide. How many acres does it contain?

The pupils should estimate 40 rd. in the length of the street,
if it is 4 rd. wide, so as to see how large an acre is. They should
measure the school grounds and find the area in square rods.
It is also advantageous to measure an acre near the school, so
as to visualize this important unit.

ORAL EXERCISE

1. If each of these bales of cotton weighs 500 lb.,



how many pounds does the load of cotton weigh? How many tons?

2. If the driver weighs 150 lb., and the wagon weighs 1200 lb., what is the total load these horses are drawing?

3. If the cotton is worth 10 ct. a pound, what is the value of each bale? of all the bales?

WRITTEN EXERCISE

1. If a bale of cotton weighs 500 lb., and this country produces 10,000,000 bales a year, how much does one year's product of cotton weigh?

2. If this cotton is worth 10 ct. a pound, how much is the year's product worth?

3. If Texas produces .35 of the cotton in this country, how many bales are produced there in a year?

4. America produces five times as much cotton as the rest of the world. At the above rate, how many bales does the rest of the world produce? How many pounds, at 500 lb. to the bale?

ORAL EXERCISE

1. This boy has been given an acre of land for a garden. It is 10 rd. wide. How long is it? Draw a plan on the board.

2. He stretched a line lengthwise through the middle of the garden. How many square rods on each side?

3. He cut one of the two strips into 4 plots, 2 rd., 2 rd., 6 rd., and 6 rd. long. How many square rods in each?

4. He cut the other strip into 5 plots, 2 rd., 2 rd., 6 rd., 3 rd., and 3 rd. long. How many square rods in each?



WRITTEN EXERCISE

1. Draw a diagram of the plots, $\frac{1}{2}$ in. to 1 rd.
2. At 2 bu. to the acre, how much seed did he need for the peas, the bed being 2 rd. by 5 rd.?
3. At $1\frac{1}{2}$ bu. to the acre, how much seed did he need for the beans, the bed being 2 rd. by 5 rd.?
4. At 8 bu. to the acre, how many bushels of potatoes did he need, the bed being 6 rd. by 5 rd.?

WRITTEN EXERCISE

1. A man bought a piece of land near the edge of a village. The land was 50 rd. long on the street, and 16 rd. deep. How many acres in the land?

2. At \$375 an acre, how much did it cost?

3. He cut the land into building lots, each 5 rd. front. How many lots did he have? Draw a diagram of the land showing the lots.

4. How many feet long and wide was each of the building lots? What was the area of each in square feet? in parts of an acre?

5. He sold these lots at \$325 each. How much did he gain on all the land?

6. A purchaser of one of the lots put a fence around the three sides not facing the street. The fence cost \$4.50 a rod. How much did it all cost?

7. This same purchaser built a house that cost \$3258.75, and spent \$687.25 for furniture and \$62.50 for grading. How much did the house, lot, grading, and fencing cost?

8. If he can save \$750 a year, how long will it take this purchaser to save enough to pay the amount found in Ex. 7?

9. This man built his house 3 rd. from the street, and laid a 4-ft. sidewalk to his front door. At 20 ct. a square foot, how much did this walk cost?

ORAL EXERCISE

1. A class in cooking finds that a cup of butter weighs 8 oz. How many cups to the pound?
2. At $7\frac{1}{2}$ oz. to the cup, how much do two cups of sugar weigh?
3. At $8\frac{1}{2}$ oz. to the cup, how much do two cups of rice weigh?
4. At 8 oz. to the cup, how many pounds do 5 cups of milk weigh?
5. At two tablespoonfuls to the ounce, how many tablespoonfuls of sugar to the pound?

WRITTEN EXERCISE

1. For our laundry we need 3 roller towels of $7\frac{1}{2}$ yd. each. How many yards must we purchase?
2. The toweling costs 12 ct. a yard. How much does it all cost?
3. We bought 2 tubs at $87\frac{1}{2}$ ct. each. How much did we pay for both? How much for the tubs and a 30-ct. washboard?
4. We bought 2 starch bowls at the rate of 8 for \$1. How much did the two cost?
5. The teakettle cost 97 ct., the pan 63 ct., and the boiler \$1.50. What did the three cost?
6. What did our 4 flatirons cost at $37\frac{1}{2}$ ct. each?
7. What was the cost of 3 packages of starch at $12\frac{1}{2}$ ct. a package, and 8 cakes of soap at $4\frac{1}{2}$ ct. each?
8. Make out a bill for all of the above items.

WRITTEN EXERCISE

Suppose you had a room of your own, 15 ft. by 12 ft., having 3 windows, each 9 ft. 6 in. high, and could furnish it just as you wish.

At the stores you find these prices:

Matting, 1 yd. wide, 48 ct. a yard; rugs, \$12.50; ingrain carpet, 1 yd. wide, 65 ct. a yard; velvet carpet, 27 in. wide, \$1.10 a yard; easy chairs, \$3.25; desks, \$8.50; tables,



\$12.00; bookcases, \$7.50; sofas, \$11.00; muslin for curtains, 17 ct. a yard.

1. Draw a plan on a scale of $\frac{1}{2}$ in. to the foot.
2. On the plan show how the strips of matting, velvet carpet, or ingrain carpet would lie.
3. Not allowing for the fit of the patterns, how many yards of matting or ingrain carpet would it take? also of velvet carpet? Give the cost of each.
4. If you were to furnish the room just as you would like, from the materials with prices given above, what would you put into the room? Make out a bill for the total, not forgetting the floor, curtains, and the furniture.

WRITTEN EXERCISE

1. We have 195,886.9 miles of railroad in our country, besides 70,105.5 miles of second tracks and sidings. How many miles of track in all?



2. We have 39,729 locomotives and 40 times as many cars. How many cars have we? Can one engine draw 40 cars? 40 passenger cars?

3. There are 27,144 passenger cars in the country. At 60 persons to a car, how many persons could they all carry at once?

4. On an average, 548 people are employed to every 100 mi. of railroad. Think of some place 25 mi. away, and tell from this how many people are employed for that distance.

5. A conductor receives on an average \$3.17 a day. If he works 330 days to the year, how much is the average yearly salary?

6. About how far is it from where you live to the nearest very large city? At 3 ct. a mile, how much would it cost a man to go there? How much would it cost you, at half fare?

WRITTEN EXERCISE

1. The canals more than 100 mi. long, in this country, are the Chesapeake and Ohio, 184 mi.; Erie, 387 mi.; Illinois and Michigan, 102 mi.;



Lehigh, 108 mi.; Miami and Erie, 274 mi.; Morris, 103 mi.; Ohio, 317 mi.; Pennsylvania, 193 mi.; and Schuylkill, 108 mi. What is their total length?

2. If 3 canal boatmen receive \$35.50 apiece per month, and 1 man receives \$42.25 and another \$45.75, what are the wages of all five who run the boat?

3. It costs \$0.50 a day to feed each of the 6 mules that draw the boat (3 working at a time). How much does it cost for fodder for a 10-day trip from Buffalo to Albany?

4. Of two boats drawn by the same team, one carries 238.75 tons of freight, and the other 246.75 tons; how much do the two carry? If they average this amount, how much would they carry in the 12 trips they make in a year?

WRITTEN EXERCISE

1. $27.4 + 6.27 + .34$.
2. $6.35 + 0.65 + 143$.
3. $3.26 + .47 + 26.9$.
4. $\$2.55 + \$3 + \$0.27$.
5. $4.8 + 62.04 + 3.2$.
6. $8 \text{ ft.} + .8 \text{ ft.} + 1.2 \text{ ft.}$
7. $4.09 + 3.01 + 2.9$.
8. $17\frac{3}{4} \text{ ft.} - 9\frac{3}{4} \text{ ft.}$
9. $26.32 \text{ in.} - 9 \text{ in.}$
10. $400 \text{ ft.} - 89.9 \text{ ft.}$
11. $67 \text{ acres} - 1\frac{1}{5} \text{ acres.}$
12. $127.62 \text{ in.} - 4.8 \text{ in.}$
13. $.3 \text{ of } \$125$.
14. $.25 \text{ of } \$320$.
15. $.33\frac{1}{3} \text{ of } \420 .
16. $.75 \text{ of } \$164$.
17. $.25 \text{ of } \$1236$.
18. $.33\frac{1}{3} \text{ of } \1110 .
19. $.75 \text{ of } \$3016$.
20. $.06\frac{1}{4} \text{ of } \1760 .
21. $2\frac{3}{4} \text{ times } 111 \text{ in.}$
22. $3\frac{1}{2} \text{ times } \125 .
23. $4\frac{1}{2} \text{ times } 80 \text{ yd.}$
24. $\frac{5}{8} \text{ of } 360 \text{ sq. rd.}$
25. $\frac{3}{8} \text{ of } 625 \text{ cu. in.}$
26. $\frac{3}{8} \text{ of } 1728 \text{ cu. in.}$
27. $60 \text{ sq. ft.} - .82 \text{ sq. ft.}$
28. $75.5 \text{ mi.} - 6.75 \text{ mi.}$
29. $42.3 \text{ yd.} - 9.23 \text{ yd.}$
30. $40 \text{ mi.} - 19.25 \text{ mi.}$
31. $1276 \text{ sq. in.} - .27 \text{ sq. in.}$
32. $2.3 \text{ in.} + 6.8 \text{ in.} + .27 \text{ in.}$
33. $7 \text{ yd.} + 7.7 \text{ yd.} + 9.3 \text{ yd.}$
34. $6 \text{ mi.} + 8.9 \text{ mi} + 5.65 \text{ mi.}$
35. $325.4 \text{ cu. ft.} - 87.06 \text{ cu. ft.}$
36. If 2 pencils cost 5¢, what will 36 cost?
37. If 7 balls cost \$1.05, what will 9 cost?
38. If 17 books cost \$5.10, what will 15 cost?
39. If 6 yd. of carpet cost \$8, what will 5 cost?
40. If 8 bottles of ink cost 72¢, what will 5 cost?
41. If 9 thermometers cost \$2.43, what will 7 cost?
42. If $\frac{3}{4}$ gal. of oil costs 9¢, what will 7 gal. cost?

PERCENTAGE

ORAL EXERCISE

1. How many 10's in 40? How much is $\frac{1}{10}$ of 40?
2. How many 50's in 100? How much is $\frac{1}{50}$ of 100?
3. How many 100's in 500? How much is $\frac{1}{100}$ of 500?
4. How much is $\frac{1}{100}$, or .01, of 200? of \$1? of \$2?
5. Then how much is .05 of 200? of \$1? of \$2?

There is another name for $\frac{1}{100}$, or .01, besides *one one-hundredth*. It is *one per cent*.

One per cent means the same as one one-hundredth.

Two per cent means the same as two hundredths.

Six per cent means the same as six hundredths.

Usually six per cent is written 6%.

You should remember that 6%, $\frac{6}{100}$, .06, all mean the same.

WRITTEN EXERCISE

1. Write 5% as a common fraction; as a decimal fraction.
2. Write $\frac{25}{100}$ as a decimal fraction; also using the sign %.
3. Write .50 as a common fraction; also using the sign %.

Classes which are to continue in the second book of this series may omit this and the following pages.

ORAL EXERCISE

1. How much is $400 \div 100$? $\frac{1}{100}$ of 400? 1% of 400?

2. Then how much is $\frac{2}{100}$ of 400? 2% of 400? 3% of 400?

3. Because $375 \div 100 = 3\frac{75}{100}$, or 3.75, 1% of 375 is how many?

4. Then how much is 1% of 240? of 465? of 535? of 762? of 850?

5. Then how do you easily find 1% of a number?

To find 1% of a number, place a decimal point to the left of tens.

That is,

1% of 425 is 4.25, because $425 \div 100 = 4.25$;

1% of \$352 is \$3.52, because $\$352 \div 100 = \3.52 ;

1% of 24.5 is .245, because $24.5 \div 100 = .245$.

6. How much is

1% of \$240? 1% of \$370? 1% of \$4200?

1% of \$475? 1% of \$225? 1% of \$6325?

1% of 25.5? 1% of \$35.30? 1% of \$426.50?

7. By what must you multiply 1% to get 5%?
How much is 1% of \$200? How much is 5% of \$200?

8. How much is

6% of \$200? 4% of \$500? 3% of \$400?

2% of \$1000? 3% of \$100? 5% of \$300?

3% of \$6000? 8% of \$200? 7% of \$500?

You have now found that to take 6% of a number you may first take 1%, by dividing by 100, and then multiply by 6. Other per cents are found in the same way.

Required to find 8% of \$642.	\$642
1% of \$642 = \$6.42, and 8% of \$642 = 8	\$6.42
times \$6.42, or \$51.36.	8
	<hr/> \$51.36

WRITTEN EXERCISE

In Exs. 1-10 find the per cents stated:

1. 5% of \$425.
2. 6% of \$750.
3. 3% of \$250.
4. 4% of \$800.
5. 6% of \$370.
6. 8% of \$420.
7. 10% of \$275.
8. 12% of \$550.
9. $6\frac{1}{2}\%$ of \$500.
10. $12\frac{1}{2}\%$ of \$400.
11. Out of a school of 250, 6% are sick. How many are sick?
12. Out of a class of 50, 10% failed to be promoted. How many failed?
13. Out of a school of 200, 55% are girls. How many are girls? How many are boys?
14. A 30-ft. fish line shrinks 5% on being put into water. How much does it shrink?
15. A 250-ft. kite string shrinks 3% after being out in the rain. How much does it shrink?
16. If you have 82% in spelling, how many words did you spell correctly out of 100? out of 50? If you have 90% in arithmetic, how many questions did you answer correctly out of 10?

DISCOUNTS

ORAL EXERCISE

1. At a bargain sale a dealer offers a \$2 sled at 10% off. How much is it reduced in price?
2. He offers a 50-ct. knife at 20% off. How much is it reduced in price? ($20\% = \frac{20}{100} = \frac{1}{5}$.)
3. A fishing rod is marked \$2.50, but he offers it at 20% off. How much does it then cost?
4. A dealer offers a \$10 suit at 10% off. What is the price now?
5. Your book dealer buys \$40 worth of books at 20% off. How much does he pay for them?

A reduction made in the marked price of goods is called a *discount*.

Discounts are usually reckoned in per cent.

The discount on \$350 worth of goods at 20%, and the cost, are found thus:

$$20\% \text{ of } \$350 = \$70, \text{ discount.}$$

$$\$350 - \$70 = \$280, \text{ cost.}$$

WRITTEN EXERCISE

Find the discount and cost of the following:

1. \$250 worth of goods at 25% discount.
2. \$320 worth of goods at 15% discount.
3. \$440 worth of goods at $12\frac{1}{2}\%$ discount.
4. \$225 worth of goods at 33% discount.
5. A \$12 suit of clothes at 20% discount.
6. A \$30 set of furniture at $33\frac{1}{3}\%$ discount.

INTEREST

ORAL EXERCISE

1. How much is 4% of \$50?
2. How much is 5% of \$200?
3. How much is 6% of \$300?
4. How much is 3% of \$120?

When a man borrows money he pays for it by a certain per cent of the amount borrowed.

The money paid for the use of other money is called *interest*.

If the interest is 6% a year, a man would pay for the use of \$200,

6% of \$200, or \$12, if he kept it a year;

$\frac{1}{2}$ of 6% of \$200, or \$6, for $\frac{1}{2}$ year, or 6 mo.;

$\frac{1}{3}$ of 6% of \$200, or \$4, for $\frac{1}{3}$ year, or 4 mo.;

2 times 6% of \$200, or \$24, for 2 years.

How much is the interest on \$350 for 8 mo. at 4% per year?

4% of \$350 = \$14, interest for one year;

8 mo. = $\frac{2}{3}$ of a year, or $\frac{2}{3}$ of a year;

$\frac{2}{3}$ of \$14 = \$9.33, interest for $\frac{2}{3}$ yr.

WRITTEN EXERCISE

Find the interest on the following:

1. \$300 for 1 yr. at 6% per year.
2. \$400 for 2 yr. at 5% per year.
3. \$125 for 6 mo. at 4% per year.
4. \$375 for 3 yr. at 4% per year.

WRITTEN EXERCISE

Find the interest on the following:

1. \$200 for 4 yr. at 5%.
2. \$350 for 2 yr. at 6%.
3. \$250 for 3 yr. at 4%.
4. \$400 for $1\frac{1}{2}$ yr. at 5%.
5. \$100 for 9 mo. at 6%.
6. \$50 for 1 yr. at 5%.
7. \$75 for 6 mo. at 4%.
8. \$50 for 8 mo. at 6%.
9. \$250 for 6 mo. at 5%.

When money is borrowed the written promise to pay it back again is called a *promissory note*. A promissory note usually reads like this:

\$200

Chicago, Ill., [Date]

Six months after date, for value received, I promise to pay to John Jones, or order, the sum of two hundred dollars, with interest at 5%.

John Smith.

10. Make out and sign a promissory note for \$50, payable to the order of John X., in 6 mo., with interest at 6%. Then find the interest.

11. Also one to the same man, for \$100, due in 3 mo., with interest at 5%. Find the interest.

12. Also one to the same man, for \$200, due in 1 yr., with interest at 4%. Find the interest.

WRITTEN EXERCISE

- | | |
|---|---|
| 1. $469 + 289 + 73.4$. | 2. $6825 + .71 + 7.29$. |
| 3. $12,407 - 8798$. | 4. $21,000 - 16,725$. |
| 5. $\$4283 - \275.50 . | 6. $\$683.50 - \217.75 . |
| 7. $147\frac{1}{2}$ ft. $- 68\frac{3}{4}$ ft. | 8. $623\frac{5}{8}$ yd. $- 87\frac{3}{4}$ yd. |
| 9. $64 \times 62 \times 8\frac{1}{4}$. | 10. $825 \times 175 \times 14$. |
| 11. $175 \times 23 \times 60$. | 12. $2 \times 3 \times 4 \times 5 \times 6$. |
| 13. $82\frac{1}{2}$ times 475. | 14. $68\frac{7}{8}$ times 488. |
| 15. $54\frac{3}{4}$ times $\$48$. | 16. $24\frac{2}{3}$ times $\$39$. |
| 17. $7395 + 435$. | 18. $\$75 \div 125$. |
| 19. $2668 + 116$. | 20. $2951 \div 227$. |
| 21. $7650 + 340$. | 22. $3780 \div 120$. |
| 23. $\$6.25 + 125$. | 24. $\$630 \div 150$. |
| 25. $\frac{1}{16}$ of $22\frac{1}{2}$ ft. | 26. $13,875 \div 125$. |
| 27. $\$2670 + 240$. | 28. $61,206 \div 606$. |
| 29. $22,725 + 225$. | 30. $\frac{1}{25}$ of $87\frac{1}{2}$ cu. in. |

Express as common fractions:

- | | | | | |
|----------|----------|----------|----------|----------|
| 31. .64. | 32. .36. | 33. .85. | 34. .55. | 35. .90. |
| 36. .66. | 37. .16. | 38. .37. | 39. .62. | 40. .87. |

Express as decimal fractions or as whole numbers and decimals:

- | | | | | |
|----------------------|----------------------|-----------------------|-----------------------|----------------------|
| 41. $\frac{3}{8}$. | 42. $\frac{4}{9}$. | 43. $\frac{6}{10}$. | 44. $\frac{9}{10}$. | 45. $\frac{1}{5}$. |
| 46. $2\frac{1}{2}$. | 47. $3\frac{2}{5}$. | 48. $5\frac{7}{10}$. | 49. $7\frac{2}{10}$. | 50. $9\frac{1}{5}$. |
51. How much is 16% of \$240? of \$175? of \$325? of \$450? of \$1200? of \$2575?
52. At $33\frac{1}{3}\%$ discount, what will an \$18 suit of clothes cost? a \$27.75 suit?

DECIMAL FRACTIONS CONTINUED

Because $3\frac{1}{3} = \frac{10}{3}$ (page 224), therefore
 $.3\frac{1}{3} = \frac{10}{3} \div 10 = \frac{1}{3}$. In the same way, $12\frac{1}{2} = \frac{25}{2}$,
 and $.12\frac{1}{2} = \frac{1}{100}$ of $\frac{25}{2} = \frac{25}{2 \times 100} = \frac{1}{8}$ (page 223).

ORAL EXERCISE

Reduce to common fractions:

- | | | |
|---|---|---|
| 1. $2\frac{1}{3}$, $.2\frac{1}{3}$. | 2. $1\frac{1}{2}$, $.1\frac{1}{2}$. | 3. $3\frac{1}{4}$, $.3\frac{1}{4}$. |
| 4. $4\frac{1}{5}$, $.4\frac{1}{5}$. | 5. $3\frac{1}{6}$, $.3\frac{1}{6}$. | 6. $4\frac{1}{8}$, $.4\frac{1}{8}$. |
| 7. $3\frac{1}{3}$, $.03\frac{1}{3}$. | 8. $2\frac{1}{5}$, $.02\frac{1}{5}$. | 9. $2\frac{1}{8}$, $.02\frac{1}{8}$. |
| 10. $2\frac{1}{4}$, $.02\frac{1}{4}$. | 11. $5\frac{1}{4}$, $.05\frac{1}{4}$. | 12. $3\frac{1}{2}$, $.03\frac{1}{2}$. |

Express as cents:

13. $\$0.2\frac{1}{2}$. 14. $\$0.3\frac{1}{2}$. 15. $\$0.5\frac{1}{2}$. 16. $\$0.3\frac{1}{5}$.

In Ex. 16 we have 3 dimes and $\frac{1}{5}$ of a dime.

17. $\$0.2\frac{1}{5}$. 18. $\$0.7\frac{1}{5}$. 19. $\$0.5\frac{1}{5}$. 20. $\$1.2\frac{1}{2}$.

WRITTEN EXERCISE

Reduce to common fractions:

- | | | | | |
|------------------------|------------------------|------------------------|------------------------|------------------------|
| 1. $.12\frac{1}{3}$. | 2. $.32\frac{1}{2}$. | 3. $.41\frac{1}{8}$. | 4. $.26\frac{1}{3}$. | 5. $.22\frac{1}{2}$. |
| 6. $.66\frac{2}{3}$. | 7. $.33\frac{1}{3}$. | 8. $.37\frac{1}{2}$. | 9. $.62\frac{1}{2}$. | 10. $.87\frac{1}{2}$. |
| 11. $.02\frac{1}{3}$. | 12. $.03\frac{2}{3}$. | 13. $.05\frac{2}{3}$. | 14. $.07\frac{1}{3}$. | 15. $.11\frac{1}{3}$. |
| 16. $.77\frac{1}{3}$. | 17. $.28\frac{1}{3}$. | 18. $.56\frac{2}{3}$. | 19. $.48\frac{2}{3}$. | 20. $.69\frac{1}{3}$. |

Express as per cents, using the sign %:

- | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 21. .23. | 22. .42. | 23. .75. | 24. .62. | 25. .41. |
| 26. .2. | 27. .3. | 28. .5. | 29. .7. | 30. .8. |
| 31. $.2\frac{1}{2}$. | 32. $.3\frac{1}{8}$. | 33. $.5\frac{1}{5}$. | 34. $.7\frac{1}{2}$. | 35. $.8\frac{1}{5}$. |

REVIEW OF PRIMARY ARITHMETIC

If desired this review may be taken immediately after the indicated parts of the book have been studied.

REVIEWING PAGES 32-50

ORAL EXERCISE

In each column add the numbers to the right of

1. A and B. 2. B and C.
3. C and D. 4. D and E.
5. E and F. 6. F and G.

	I	II	III	IV	V	VI	VII
A	62	7	23	9	30	8	31
B	3	21	8	30	7	62	7
C	47	2	53	6	22	3	42
D	2	45	4	41	5	94	5
E	25	4	70	8	41	4	34
F	4	33	6	21	7	32	6
G	36	2	44	6	33	7	44

In each row add the numbers below

7. I and II.
8. II and III.
9. III and IV.
10. IV and V. 11. V and VI. 12. VI and VII.

WRITTEN EXERCISE

In each column add the numbers to the right of

1. A and B. 2. B and C.
3. C and D. 4. D and E.
5. E and F. 6. A to C.
7. B to D. 8. C to E.
9. D to F. 10. A to D.
11. B to E. 12. C to F.
13. A to E. 14. B to F.
15. A to F.

	I	II	III	IV	V	VI	VII
A	1	27	30	20	1	10	10
B	0	11	25	30	3	10	20
C	10	10	1	3	0	32	33
D	32	0	2	1	20	24	0
E	43	1	0	15	10	10	10
F	2	12	31	30	4	0	10

ORAL EXERCISE

In each column state the difference between the two numbers to the right of

1. A and B. 2. B and C.
3. C and D. 4. D and E.
5. E and F. 6. F and G.

	I	II	III	IV	V	VI	VII
A	98	96	95	85	74	64	52
B	87	74	64	53	53	52	40
C	65	54	44	43	42	30	20
D	42	22	22	21	20	10	9
E	21	20	10	10	9	9	7
F	10	10	5	4	2	1	1
G	6	3	3	2	2	1	0

In each row state the difference between the two numbers below

7. I and II.
8. II and III.
9. III and IV.
10. IV and V.
11. V and VI.
12. VI and VII.

WRITTEN EXERCISE

In each column write the difference between the two numbers to the right of

1. A and B. 2. B and C.
3. C and D. 4. D and E.
5. E and F. 6. F and G.
7. A and C. 8. A and D.
9. A and E. 10. A and F.

	I	II	III	IV	V	VI	VII
A	98	86	86	66	54	32	22
B	87	84	76	55	24	21	20
C	85	72	65	33	23	11	9
D	74	61	51	31	21	9	6
E	63	40	40	20	11	7	4
F	60	30	20	15	10	6	2
G	40	30	10	8	7	5	0

In each row write the difference between the two numbers below

11. I and II. 12. II and III. 13. III and IV.
14. IV and V. 15. V and VI. 16. VI and VII.
17. I and III. 18. I and IV. 19. I and V.

ORAL EXERCISE

1. If I add 24 to 30, what is the result?
2. What number added to 24 will make 68?
3. What number taken from 79 will leave 52?
4. If I take half of 60 from 60, what remains?
5. If I add 40 to half of 40, what is the result?
6. Make a problem, using 30 ct., 5 ct., and 2 ct.
7. There are 67 books on a shelf. All except 35 are new. How many are new?
8. If a boy missed 6 words in a spelling lesson of 29 words, how many did he spell correctly?
9. Mary has 24 red roses and half as many white ones. How many white ones has she?
10. It takes James 10 minutes less than half an hour to come to school. How many minutes does it take him?
11. If a teacher is standing 12 ft. from one side of the room and 17 ft. from the opposite side, how wide is the room?
12. In a basket are a dozen eggs. If we add a fourth of a dozen and also a third of a dozen, how many eggs will there be?
13. There are 93 pages in Chapters I and II of this book. When you have finished page 50, how many pages are left before Chapter III?
14. Martha has a dime and 2 nickels. If she spends 3 ct. at one store and buys a 2-ct. postage stamp, how many cents will she have left?

WRITTEN EXERCISE

1. How far is it around a room 20 ft. long and 14 ft. wide?
2. What number added to $\frac{1}{4}$ of 40 equals 15? equals 20? equals 23?
3. Make a problem about $\frac{1}{6}$ of 60; about $\frac{1}{4}$ of 80; about $\frac{1}{2}$ of 40; about $\frac{1}{3}$ of 30.
4. Frank has a book of 75 pages. He has read 32 pages. How many has he still to read?
5. On a railway journey of 86 miles how many miles are left after a man has gone 12 miles?
6. There are 12 boys in one row, 6 in another, and 4 in another. How many in all three rows?
7. On a page containing 40 problems Frank solved all but $\frac{1}{4}$. How many did he solve?
8. Ruth had 28 ct., and spent 15 ct. for paper and pencils. Her father then gave her 10 ct. How much did she then have?
9. The first day of school Rose spent 44 ct. for books, 12 ct. for paper, 5 ct. for a pencil, and paid a nickel for car fare. How much did she spend?
10. Charles had 24 ct. in his bank on Monday. He put in 12 ct. on Tuesday, 10 ct. on Wednesday, and 2 ct. on Thursday. How much had he then?
11. There were 12 birds on a tree and 14 on the ground. Four birds flew from the ground to the tree. How many more were then on the tree than on the ground?

REVIEWING PAGES 51-93

ORAL EXERCISE

1. How many feet in 7 yd. and 2 ft.?
2. How many days in 4 wk. and 6 da.?
3. At 3 for a dime, what will 12 apples cost?
4. If one hat costs \$2, what will 20 hats cost?
5. If a book costs 30 ct., what will 3 books cost?
6. Edward weighs 52 lb. 8 oz., and Mary weighs 42 lb. 4 oz. What do both together weigh?
7. Henry has a peck of nuts and 2 qt. over. If he sells them at 5 ct. a quart, what will he get?
8. If a wheel goes 7 feet every time it turns, how many yards does it go in turning three times?
9. When Richard drives 3 miles he has gone $\frac{1}{8}$ of the distance to his aunt's home. How far is it to his aunt's home?
10. If the last chapter of a book is XIX, and you are at the beginning of Chapter XI, how many chapters have you yet to read?
11. Fred sold some berries, making 2 ct. on each quart. He sold 12 qt. one day and 20 qt. the next day. How much did he make?
12. A dealer pays 12 ct. a gallon for milk and sells it at 6 ct. a quart. How much does he make on a quart? on a gallon? on 2 gallons?
13. If you buy 4 lb. of meat at 9 ct. a pound, how much does it cost? If you pay for it with a half dollar, what change should you receive?

WRITTEN EXERCISE

Add the following, timing yourself:

1. \$217	2. 246 yd.	3. 276 ft.	4. 329 in.	5. \$437
<u>343</u>	<u>434</u>	<u>427</u>	<u>286</u>	<u>293</u>

6. \$127	7. 142 yd.	8. 326 ft.	9. 463 in.	10. \$123
<u>246</u>	<u>237</u>	<u>293</u>	<u>298</u>	<u>247</u>
<u>329</u>	<u>421</u>	<u>147</u>	<u>127</u>	<u>409</u>

11. 106	12. 213	13. 106	14. 132	15. 222
287	129	219	167	333
109	308	137	207	111
300	127	204	122	107
<u>114</u>	<u>135</u>	<u>317</u>	<u>109</u>	<u>112</u>

16. 121	17. 106	18. 217	19. 272	20. 319
42	92	102	129	107
37	37	69	106	28
168	15	72	43	63
29	208	31	16	29
<u>343</u>	<u>319</u>	<u>427</u>	<u>121</u>	<u>142</u>

21. \$136	22. \$127	23. \$147	24. \$192	25. \$400
42	38	29	37	125
81	25	108	91	30
92	172	32	82	19
237	81	129	263	16
148	69	70	109	128
<u>129</u>	<u>232</u>	<u>63</u>	<u>78</u>	<u>37</u>

WRITTEN EXERCISE

Subtract, timing yourself:

$$\begin{array}{r} 1. \ 236 \\ \underline{129} \end{array}$$

$$\begin{array}{r} 2. \ 342 \\ \underline{273} \end{array}$$

$$\begin{array}{r} 3. \ 409 \\ \underline{263} \end{array}$$

$$\begin{array}{r} 4. \ 527 \\ \underline{329} \end{array}$$

$$\begin{array}{r} 5. \ 400 \\ \underline{192} \end{array}$$

$$\begin{array}{r} 6. \ 326 \\ \underline{178} \end{array}$$

$$\begin{array}{r} 7. \ 409 \\ \underline{237} \end{array}$$

$$\begin{array}{r} 8. \ 600 \\ \underline{482} \end{array}$$

$$\begin{array}{r} 9. \ 725 \\ \underline{536} \end{array}$$

$$\begin{array}{r} 10. \ 908 \\ \underline{809} \end{array}$$

$$\begin{array}{r} 11. \ 752 \\ \underline{429} \end{array}$$

$$\begin{array}{r} 12. \ 360 \\ \underline{290} \end{array}$$

$$\begin{array}{r} 13. \ 728 \\ \underline{299} \end{array}$$

$$\begin{array}{r} 14. \ 342 \\ \underline{139} \end{array}$$

$$\begin{array}{r} 15. \ 801 \\ \underline{236} \end{array}$$

$$\begin{array}{r} 16. \ 712 \\ \underline{348} \end{array}$$

$$\begin{array}{r} 17. \ 801 \\ \underline{296} \end{array}$$

$$\begin{array}{r} 18. \ 902 \\ \underline{327} \end{array}$$

$$\begin{array}{r} 19. \ 711 \\ \underline{344} \end{array}$$

$$\begin{array}{r} 20. \ 628 \\ \underline{439} \end{array}$$

$$\begin{array}{r} 21. \ \$426 \\ \underline{278} \end{array}$$

$$\begin{array}{r} 22. \ \$304 \\ \underline{265} \end{array}$$

$$\begin{array}{r} 23. \ \$322 \\ \underline{148} \end{array}$$

$$\begin{array}{r} 24. \ \$209 \\ \underline{168} \end{array}$$

$$\begin{array}{r} 25. \ \$387 \\ \underline{296} \end{array}$$

$$\begin{array}{r} 26. \ \$400 \\ \underline{275} \end{array}$$

$$\begin{array}{r} 27. \ \$925 \\ \underline{560} \end{array}$$

$$\begin{array}{r} 28. \ \$305 \\ \underline{197} \end{array}$$

$$\begin{array}{r} 29. \ 492 \text{ ft.} \\ \underline{137} \end{array}$$

$$\begin{array}{r} 30. \ 286 \text{ ft.} \\ \underline{192} \end{array}$$

$$\begin{array}{r} 31. \ 840 \text{ yd.} \\ \underline{726} \end{array}$$

$$\begin{array}{r} 32. \ 927 \text{ ft.} \\ \underline{109} \end{array}$$

$$\begin{array}{r} 33. \ 209 \text{ bu.} \\ \underline{110} \end{array}$$

$$\begin{array}{r} 34. \ 325 \text{ bu.} \\ \underline{186} \end{array}$$

$$\begin{array}{r} 35. \ 430 \text{ ft.} \\ \underline{345} \end{array}$$

$$\begin{array}{r} 36. \ 535 \text{ bu.} \\ \underline{287} \end{array}$$

$$\begin{array}{r} 37. \ 520 \text{ ft.} \\ \underline{137} \end{array}$$

$$\begin{array}{r} 38. \ 480 \text{ ft.} \\ \underline{196} \end{array}$$

$$\begin{array}{r} 39. \ 322 \text{ ft.} \\ \underline{192} \end{array}$$

$$\begin{array}{r} 40. \ 400 \text{ ft.} \\ \underline{229} \end{array}$$

ORAL EXERCISE

- | | | |
|-----------------------|-----------------------|-----------------------|
| 1. $2 \times 1 + 1.$ | 2. $2 \times 2 + 1.$ | 3. $2 \times 3 + 1.$ |
| 4. $2 \times 4 + 1.$ | 5. $2 \times 5 + 1.$ | 6. $3 \times 1 + 1.$ |
| 7. $3 \times 2 + 1.$ | 8. $3 \times 3 + 1.$ | 9. $3 \times 4 + 1.$ |
| 10. $3 \times 5 + 1.$ | 11. $3 \times 1 + 2.$ | 12. $3 \times 2 + 2.$ |
| 13. $3 \times 3 + 2.$ | 14. $3 \times 4 + 2.$ | 15. $3 \times 5 + 2.$ |
| 16. $4 \times 1 + 1.$ | 17. $4 \times 2 + 1.$ | 18. $4 \times 3 + 1.$ |
| 19. $4 \times 4 + 1.$ | 20. $4 \times 5 + 1.$ | 21. $4 \times 1 + 2.$ |
| 22. $4 \times 2 + 2.$ | 23. $4 \times 3 + 2.$ | 24. $4 \times 4 + 2.$ |
| 25. $4 \times 5 + 2.$ | 26. $4 \times 1 + 3.$ | 27. $4 \times 2 + 3.$ |
| 28. $4 \times 3 + 3.$ | 29. $4 \times 4 + 3.$ | 30. $4 \times 5 + 3.$ |
| 31. $5 \times 1 + 1.$ | 32. $5 \times 2 + 1.$ | 33. $5 \times 3 + 1.$ |
| 34. $5 \times 4 + 1.$ | 35. $5 \times 5 + 1.$ | 36. $5 \times 1 + 2.$ |
| 37. $5 \times 2 + 2.$ | 38. $5 \times 3 + 2.$ | 39. $5 \times 4 + 2.$ |
| 40. $5 \times 5 + 2.$ | 41. $5 \times 1 + 3.$ | 42. $5 \times 2 + 3.$ |
| 43. $5 \times 3 + 3.$ | 44. $5 \times 4 + 3.$ | 45. $5 \times 5 + 3.$ |
| 46. $5 \times 1 + 4.$ | 47. $5 \times 2 + 4.$ | 48. $5 \times 3 + 4.$ |
| 49. $5 \times 4 + 4.$ | 50. $5 \times 5 + 4.$ | 51. $5 \times 5 + 5.$ |

WRITTEN EXERCISE

Multiply, timing yourself:

- | | | | | | |
|----------|----------|----------|----------|----------|----------|
| 1. 32 | 2. 29 | 3. 47 | 4. 53 | 5. 65 | 6. 61 |
| <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>4</u> | <u>5</u> |
| 7. 62 | 8. 26 | 9. 36 | 10. 63 | 11. 66 | 12. 73 |
| <u>4</u> | <u>3</u> | <u>2</u> | <u>4</u> | <u>5</u> | <u>6</u> |
| 13. 27 | 14. 63 | 15. 54 | 16. 45 | 17. 43 | 18. 39 |
| <u>5</u> | <u>4</u> | <u>3</u> | <u>2</u> | <u>4</u> | <u>5</u> |

ORAL EXERCISE

1. At \$32 each, what do 2 cows cost?
2. At \$33 each, what do 3 cows cost?
3. At \$12 each, what do 3 tables cost?
4. At \$60 each, what do 2 horses cost?
5. At \$20 a month, what is 4 months' rent?
6. At \$22 a dozen, what do 3 doz. hats cost?
7. At \$24 a dozen, what do 2 doz. lamps cost?
8. At \$34 a set, what do 2 sets of furniture cost?
9. At \$42 an acre, what do 2 acres of land cost?
10. At \$40 an acre, what do 3 acres of land cost?
11. At \$30 a dozen, what do 4 dozen chairs cost?
12. At \$30 a set, what do 4 sets of furniture cost?
13. At \$20 a suit, what do 5 suits of clothes cost?
14. Mary has 22 ct. and Kate has 1 ct. less than twice as much. How much has Kate?
15. William has 14 ct. and John has 1 ct. more than twice as much. How much has John?

WRITTEN EXERCISE

Multiply, timing yourself:

- | | | | | | |
|----------|----------|----------|----------|----------|----------|
| 1. 32 | 2. 49 | 3. 76 | 4. 58 | 5. 19 | 6. 82 |
| <u>5</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>5</u> |
| 7. 27 | 8. 33 | 9. 47 | 10. 86 | 11. 29 | 12. 64 |
| <u>4</u> | <u>5</u> | <u>2</u> | <u>3</u> | <u>5</u> | <u>3</u> |
| 13. 48 | 14. 29 | 15. 38 | 16. 44 | 17. 23 | 18. 39 |
| <u>4</u> | <u>3</u> | <u>2</u> | <u>4</u> | <u>5</u> | <u>3</u> |

ORAL EXERCISE

1. How many 3's in 15? 6? 21? 9? 27? 12? 30?
2. How many 2's in 6? 4? 8? 2? 14? 20? 16?
3. How many 4's in 16? 20? 4? 36? 8? 40?
4. How many 5's in 5? 50? 10? 45? 20? 15?
5. $4 \overline{)16}$. 6. $4 \overline{)24}$. 7. $3 \overline{)36}$. 8. $2 \overline{)18}$.
9. $5 \overline{)35}$. 10. $2 \overline{)22}$. 11. $3 \overline{)27}$. 12. $5 \overline{)55}$.
13. $2 \overline{)18}$. 14. $3 \overline{)27}$. 15. $4 \overline{)36}$. 16. $3 \overline{)40}$.
17. At \$4 each, how many hats will \$28 buy?
18. At \$2 each, how many sleds will \$20 buy?
19. At \$4 each, how many desks will \$44 buy?
20. At \$3 each, how many books will \$24 buy?
21. At \$5 each, how many sheep will \$35 buy?
22. At \$3 each, how many lamps will \$30 buy?
23. At \$2 each, how many chairs will \$18 buy?
24. At \$5 each, how many tables will \$35 buy?
25. At \$3 each, how many stands will \$27 buy?

WRITTEN EXERCISE

1. $3 \overline{)336}$. 2. $4 \overline{)444}$. 3. $3 \overline{)936}$. 4. $5 \overline{)555}$.
5. $3 \overline{)369}$. 6. $3 \overline{)633}$. 7. $4 \overline{)848}$. 8. $2 \overline{)806}$.
9. $4 \overline{)804}$. 10. $5 \overline{)500}$. 11. $3 \overline{)699}$. 12. $2 \overline{)208}$.
13. $3 \overline{)306}$. 14. $4 \overline{)840}$. 15. $2 \overline{)824}$. 16. $4 \overline{)888}$.
17. At \$3 each, how many books will \$69 buy?
18. At \$5 each, how many tables will \$550 buy?
19. At \$4 each, how many desks will \$404 buy?
20. At \$4 each, how many lamps will \$484 buy?
21. At 3 ct. each, how many pencils will 96 ct. buy?

REVIEWING PAGES 94-128

ORAL EXERCISE

Add from the bottom to the top, checking the result by adding from the top to the bottom:

1. 3	2. 9	3. 2	4. 5	5. 6	6. 8	7. 2	8. 5
2	2	8	8	8	2	8	3
4	3	7	3	2	3	3	8
6	7	3	8	5	4	6	2
5	6	4	2	5	7	9	6
7	5	9	9	7	6	8	9
9	8	6	3	3	2	7	8
<u>3</u>	<u>2</u>	<u>8</u>	<u>9</u>	<u>2</u>	<u>9</u>	<u>4</u>	<u>3</u>

These are types of problems to be written on the board for rapid drill work.

WRITTEN EXERCISE

Add, checking as stated above:

1. 23	2. 89	3. 37	4. 85	5. 81
48	64	40	23	72
72	73	29	40	35
69	29	82	27	86
<u>43</u>	<u>82</u>	<u>76</u>	<u>82</u>	<u>92</u>
6. 128	7. 834	8. 823	9. 828	10. 348
932	281	204	926	492
486	342	896	349	687
529	907	480	877	402
348	602	320	492	374
<u>726</u>	<u>270</u>	<u>981</u>	<u>681</u>	<u>200</u>

11. \$127.50	12. \$128.40	13. \$282.00	14. \$375.25
29.60	134.00	127.00	42.80
32.80	29.86	35.98	6.75
142.70	41.75	21.76	0.27
36.00	234.60	142.82	13.42
42.75	12.42	39.50	23.61
31.42	314.73	236.45	180.00
11.35	15.92	37.50	17.65
<u>21.07</u>	<u>26.70</u>	<u>29.48</u>	<u>32.80</u>

In Exs. 15-22, check each result by adding the sum of the first four numbers to the sum of the last four:

15. \$134.48	16. \$125.50	17. \$298.73	18. \$372.82
29.64	29.72	42.81	600.25
9.27	134.00	168.00	408.30
3.05	286.75	425.50	270.09
28.06	120.00	209.08	62.85
42.71	23.45	700.00	131.96
296.32	8.20	63.75	29.72
<u>38.00</u>	<u>19.62</u>	<u>41.50</u>	<u>37.00</u>
19. \$162.82	20. \$628.75	21. \$342.98	22. \$826.49
63.48	42.96	172.86	298.39
41.79	134.82	49.83	827.63
29.63	148.96	128.49	294.81
128.34	273.48	23.67	372.42
263.98	107.62	42.91	862.84
471.26	34.81	87.08	981.96
<u>29.42</u>	<u>29.62</u>	<u>231.00</u>	<u>286.43</u>

ORAL EXERCISE

1. How many 2's in 2? 4? 8? 16? 20? 22?
2. How many 2's in 3, and what remainder? in 9? 7? 11? 17? 21? 15? 23? 13? 25? 19? 31? 41?
3. How many 3's in 4, and what remainder? in 7? 8? 31? 10? 16? 22? 17? 19? 13? 15? 23? 25?

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 4. $4 \overline{)5}$. | 5. $4 \overline{)6}$. | 6. $4 \overline{)7}$. | 7. $4 \overline{)9}$. |
| 8. $4 \overline{)11}$. | 9. $4 \overline{)13}$. | 10. $4 \overline{)15}$. | 11. $4 \overline{)17}$. |
| 12. $4 \overline{)21}$. | 13. $4 \overline{)22}$. | 14. $4 \overline{)23}$. | 15. $4 \overline{)25}$. |
| 16. $5 \overline{)16}$. | 17. $5 \overline{)18}$. | 18. $5 \overline{)21}$. | 19. $5 \overline{)23}$. |
| 20. $5 \overline{)29}$. | 21. $5 \overline{)32}$. | 22. $5 \overline{)34}$. | 23. $5 \overline{)37}$. |
| 24. $6 \overline{)25}$. | 25. $6 \overline{)28}$. | 26. $6 \overline{)32}$. | 27. $6 \overline{)34}$. |
| 28. $6 \overline{)49}$. | 29. $6 \overline{)52}$. | 30. $6 \overline{)56}$. | 31. $6 \overline{)63}$. |
| 32. $7 \overline{)25}$. | 33. $7 \overline{)29}$. | 34. $7 \overline{)34}$. | 35. $7 \overline{)39}$. |
| 36. $7 \overline{)48}$. | 37. $7 \overline{)52}$. | 38. $7 \overline{)58}$. | 39. $7 \overline{)60}$. |
| 40. $8 \overline{)25}$. | 41. $8 \overline{)29}$. | 42. $8 \overline{)31}$. | 43. $8 \overline{)35}$. |
| 44. $8 \overline{)42}$. | 45. $8 \overline{)45}$. | 46. $8 \overline{)50}$. | 47. $8 \overline{)55}$. |
| 48. $9 \overline{)23}$. | 49. $9 \overline{)38}$. | 50. $9 \overline{)42}$. | 51. $9 \overline{)50}$. |

WRITTEN EXERCISE

- | | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|
| 1. $6 \overline{)1234}$. | 2. $5 \overline{)1264}$. | 3. $3 \overline{)2986}$. | 4. $4 \overline{)3682}$. |
| 5. $2 \overline{)3333}$. | 6. $4 \overline{)1265}$. | 7. $5 \overline{)8213}$. | 8. $4 \overline{)2807}$. |
| 9. $7 \overline{)2120}$. | 10. $7 \overline{)3142}$. | 11. $7 \overline{)6283}$. | 12. $8 \overline{)2840}$. |
| 13. $6 \overline{)3042}$. | 14. $6 \overline{)2187}$. | 15. $8 \overline{)3190}$. | 16. $9 \overline{)8142}$. |
| 17. $9 \overline{)2130}$. | 18. $9 \overline{)2640}$. | 19. $9 \overline{)8180}$. | 20. $7 \overline{)8263}$. |
| 21. $5 \overline{)6666}$. | 22. $4 \overline{)2343}$. | 23. $5 \overline{)4444}$. | 24. $6 \overline{)4002}$. |
| 25. $4 \overline{)1763}$. | 26. $5 \overline{)8100}$. | 27. $2 \overline{)7777}$. | 28. $3 \overline{)4007}$. |
| 29. $4 \overline{)7373}$. | 30. $8 \overline{)9119}$. | 31. $9 \overline{)9074}$. | 32. $8 \overline{)6606}$. |

WRITTEN EXERCISE

1. At 3 ct. a cake, what do 2 doz. cakes of soap cost? How much change is due out of \$1?

2. At 8 ct. a pound for rice and 5 ct. a pound for tapioca, how much will 8 lb. of each cost?

3. At 5 ct. a pound, what do 16 lb. of sugar cost? How much change is due out of \$1?

4. At 16 ct. a pound, what does a 2-lb. cake cost? How much change is due out of 50 ct.?

5. At 3 ct. a loaf, how much must a dealer pay a baker for 23 loaves of bread? If the dealer sells the bread at 5 ct. a loaf, how much does he gain?

6. Margaret bought 2 lb. of raisins at 35 ct. a pound, and a gallon of maple sirup for \$1.15. She gave the grocer \$2. What change was due?

7. If a box of starch costs 57 ct. and a bag of flour costs 88 ct., what do the two together cost? What change should be received from a \$5 bill paid the grocer?

8. A woman buys 3 boxes of soda crackers at 9 ct. a box, and 4 boxes of oatmeal crackers at 12 ct. a box. She hands the grocer a \$1 bill. How much change is due her?

9. John's mother sent him to buy some groceries. He paid 33 ct. for chocolate, 35 ct. for coffee, 48 ct. for tea, and bought $\frac{1}{2}$ lb. of walnuts at 18 ct. a pound. He gave the grocer \$1.50. How much change was due him?

10. A farmer paid \$210 for sheep at \$6 each. How many did he buy?

11. A dealer bought 9 tables for \$135. How much did each table cost?

12. A farmer bought 32 sheep at \$7 each. How much did they cost?

13. A man saved \$27 a month for 8 months. How much did he save in all?

14. In a certain city the length of 3 blocks is 792 ft. What is the average length of a block?

15. There are 280 children in a school of 8 grades. How many are there, on an average, in each grade?

16. Which amounts to more, \$48 a month for 2 months, or \$34 a month for 3 months? How much more?

17. In a certain school they use 252 pencils a term. Allowing 2 pencils to each pupil, how many pupils are there?

18. Some bricks are piled one on top of the other to a height of 78 in. The bricks are 2 in. thick. How many are there?

19. A man saved \$224 in 7 months. How much did he save, on an average, each month? How much did he save in 6 months?

20. A man saved \$16.75 in January, \$14.60 in February, and \$21.85 in March. In April his expenses required him to use \$6.75 of his savings. How much had he left?

REVIEWING PAGES 129-170

ORAL EXERCISE

1. What do 4000 pounds of coal cost at \$5.50 a ton?
2. Which is the greater, $\frac{1}{3}$ of 93 or $\frac{1}{4}$ of 120? How much greater?
3. How many square yards of cloth in a piece 6 yd. long and 2 yd. wide?
4. How many square yards in a playground 120 ft. long and 30 ft. wide?
5. How many days are there in February, March, and April, 1907? 1908?
6. How many days are there beginning with September 1 and ending with October 30?
7. If you leave home at half past 8, and return at a quarter past 12, how long are you away?
8. A schoolroom has 3 windows, each containing 12 sq. ft. How many square yards in all?
9. School opens at 9 and closes at 4. Allowing an hour and a half for intermissions, how long are we at work in school in a day?
10. John and Henry were born the same year, John on January 21 and Henry on February 28. John is how many days older than Henry?
11. A 40-ft. telegraph pole lies across the street at right angles to the walks. It is 10 ft. from one sidewalk and 6 ft. from the opposite one. The sidewalks are 5 ft. wide. How wide is the street?

WRITTEN EXERCISE

1. A dealer pays \$2112 for 22 horses. What is the average price?

2. If a man works 23 days at \$1.75 a day, how much does he receive?

3. How far is it around a city block that is 392 ft. long and 276 ft. wide?

4. How many bushels of corn at 42 ct. a bushel can be bought for 7350 ct., or \$73.50?

5. A man saves on an average \$227.85 a year for 8 years. How much does he save in all?

6. How many more head of cattle can be bought for \$672 at \$32 a head than at \$42 a head?

7. What would the food cost during July for an army of 25,000 soldiers, allowing 39 ct. a day for each soldier?

8. On a lot which cost \$650 there is built a house costing \$2835.50 and a barn costing \$286.50. What is the total cost?

9. There are 375 pupils in the Lincoln School, 523 in the Lee School, and in the Jefferson School there are half as many as in the other two together. How many are there in the three?

10. Some workmen in a railway camp ate in one day 40 lb. of bacon at 18 ct. a pound, 65 loaves of bread at 4 ct. a loaf, 2 bu. of potatoes at 45 ct. a bushel, and butter, coffee, and milk amounting to \$6.75. What did the day's food cost?

REVIEWING PAGES 171-212

WRITTEN EXERCISE

1. Mr. Richards pays \$12 a month rent for $6\frac{1}{2}$ years. How much does he pay in all?

2. How many bushels of corn at 45 ct. a bushel will pay for 115 tons of coal at \$5.22 a ton?

3. A car load of potatoes containing 316 bu. was sold for \$145.36. How much was that a bushel?

4. If a gasolene stove uses 2 qt. of gasolene daily, at a cost of 15 ct. a gallon, what is the cost of running it during April?

5. Ruth's clothes for one year cost \$12.40, Mary's cost half as much, and John's cost \$2 more than Mary's. What did they all cost?

6. There are 416 pupils in the Washington School. The annual cost of running it is \$6240. What is the average cost for each pupil?

7. A factory paid out \$99,360 in wages in 360 days. If the average amount paid to each workman was \$3, how many workmen were there?

8. A man bought 48 yd. of carpet at \$1.25 a yard, $18\frac{1}{2}$ double rolls of paper at 64 ct. a single roll, 4 chairs at \$2.16 each, and a sofa costing \$11.75. What was the total cost?

9. Two automobiles are 216 mi. apart. If they travel towards each other, one at the rate of 17 mi. an hour and the other 7 mi. an hour slower, how long before they will meet?

ORAL EXERCISE

1. State $\frac{1}{2}$ of 8; 16; 24; 30; 40; 80; 5; 7.
2. State $\frac{1}{3}$ of 9; 15; 21; 18; 30; 60; 5; 7; 11.
3. State $\frac{2}{3}$ of 3; 6; 9; 12; 21; 18; 30; 60; 90.
4. State $\frac{1}{4}$ of 8; 16; 24; 32; 40; 44; 80; 5.
5. State $\frac{3}{4}$ of 12; 8; 20; 16; 24; 32; 40; 44.
6. State $\frac{1}{6}$ of 10; 20; 5; 15; 30; 25; 50; 55.
7. State $\frac{1}{6}$ of 12; 24; 30; 18; 42; 36; 60; 66.

Add the following:

8. $\frac{5}{8}, \frac{6}{8}, \frac{1}{8}, \frac{1}{8}, \frac{3}{4}$.
9. $\frac{7}{8}, \frac{7}{8}, \frac{5}{8}, \frac{5}{8}, \frac{3}{8}, \frac{3}{8}$.
10. $1\frac{2}{3}, 2\frac{1}{3}, 3\frac{1}{3}, 5\frac{2}{3}$.
11. $2\frac{1}{5}, 3\frac{2}{5}, 5\frac{4}{5}, 6\frac{2}{5}, 7$.

Subtract as indicated:

12. $\frac{5}{8} - \frac{1}{2}$.
13. $\frac{2}{3} - \frac{1}{6}$.
14. $\frac{7}{8} - \frac{3}{4}$.
15. $\frac{3}{5} - \frac{1}{10}$.
16. $\frac{3}{4} - \frac{1}{2}$.
17. $\frac{2}{5} - \frac{3}{10}$.
18. $\frac{7}{8} - \frac{1}{2}$.
19. $\frac{11}{15} - \frac{2}{5}$.

WRITTEN EXERCISE

1. How many cubic feet in a car 32 ft. by 8 ft. by 6 ft.?
2. How many cords of wood will the car hold?
3. A car load of coal containing 33,000 lb. is sold at \$5.50 a ton. What is the cost?
4. How many tiles 6 in. square will be required for a hall floor 27 ft. long and 9 ft. wide?
5. Represent on a scale of 2 ft. to the inch a rectangle 18 ft. by 12 ft. Find the area.
6. What is the cost of a pile of wood 120 ft. long, 4 ft. wide, and 4 ft. high, at \$4.75 a cord?

REVIEWING PAGES 213-257

ORAL EXERCISE

Study pages 157 and 227, and then tell the cost of the following:

1. 160 books at 50 ct.; at 25 ct.
2. 40 primers at 20 ct.; at 25 ct.
3. 150 knives at $33\frac{1}{3}$ ct.; at 50 ct.
4. 24 lb. of tea at 50 ct.; at $33\frac{1}{3}$ ct.
5. 105 gal. of oil at 20 ct.; at 10 ct.
6. 32 lb. of coffee at 25 ct.; at 50 ct.
7. 18 lb. of meat at $16\frac{2}{3}$ ct.; at 20 ct.
8. 444 yd. of cloth at 25 ct.; at 50 ct.
9. 60 lb. of cheese at $16\frac{2}{3}$ ct.; at 20 ct.
10. 24 lb. of meat at $12\frac{1}{2}$ ct.; at $16\frac{2}{3}$ ct.
11. 306 yd. of cloth at $33\frac{1}{3}$ ct.; at 50 ct.
12. 120 lb. of butter at $33\frac{1}{3}$ ct.; at 25 ct.
13. 160 qt. of berries at $12\frac{1}{2}$ ct.; at 10 ct.

WRITTEN EXERCISE

Write the cost, without multiplying in full:

1. 12 yd. of cloth at 25 ct.; at $33\frac{1}{3}$ ct.
2. 408 yd. of cloth at 25 ct.; at 50 ct.
3. 2 doz. coats at \$25 each; at \$20 each.
4. 4 umbrellas at \$2.50 each; at \$2.25 each.
5. $12\frac{1}{2} - 3\frac{1}{8}$. 6. $4\frac{2}{7} - 1\frac{3}{8}$. 7. $2\frac{1}{3} - 1\frac{1}{2}$.
8. $21\frac{3}{4} + 16\frac{7}{8} + 102\frac{1}{2} + 27\frac{1}{6} + 5\frac{2}{3}$.
9. $2\frac{7}{8} + 3\frac{1}{16} + 2\frac{1}{4} + 3\frac{3}{4} + 1\frac{5}{8} + \frac{7}{8}$.

WRITTEN EXERCISE

Write as decimal fractions:

1. $\frac{2}{5}$. 2. $\frac{1}{6}$. 3. $\frac{5}{10}$. 4. $\frac{7}{10}$. 5. $\frac{3}{10}$. 6. $\frac{1}{2}$.
7. 7 tenths. 8. 25 hundredths.
9. 7 hundredths. 10. 25 tenths (= 2.5).
11. 375 hundredths. 12. 37 tenths; 8 tenths.
13. Forty-two, and forty-two hundredths.
14. 3, and 75 hundredths; 99 hundredths.
15. 300, and 75 hundredths; 5 hundredths.
16. Three hundred seventy-five thousandths.
17. 45 tenths; 75 tenths; $8\frac{1}{2}$ tenths; $5\frac{1}{2}$ tenths.
18. Three hundred, and seventy-five thousandths.
19. Six, and five tenths; sixty-five tenths; six and a half; thirteen halves.
20. Five hundred fifteen thousandths; five hundred, and fifteen thousandths.
21. Of 8320 bu. of corn .15 is damaged. How many bushels are not damaged?
22. A certain room is 31.8 ft. long and 22.04 ft. wide. How far is it around the room?
23. If the average cost per mile of a certain railroad is \$10,850, what is the cost of .15 mi.?
24. A cubic foot of water weighs $62\frac{1}{2}$ lb., and a gallon of water weighs 8.33 lb. What is the difference in weight?
25. It is 270.02 mi. from Chicago to Cedar Rapids, and 220.8 mi. from Cedar Rapids to Omaha. How far is it from Chicago to Omaha?

Multiply as follows:

26. 25 by .6. 27. 37 by .9. 28. 48 by .7.
 29. 275 by .8. 30. 327 by .6. 31. 432 by .5.
 32. 23 by .23. 33. 38 by .42. 34. 26 by .81.
 35. 134 by .72. 36. 243 by .86. 37. 355 by .74.
 38. 285 by .48. 39. 496 by .39. 40. 327 by .77.
 41. 829 by .34. 42. 642 by .73. 43. 929 by .29.

Find the cost of each of the following:

44. $2\frac{1}{2}$ lb. tea @ 44¢. 45. $1\frac{1}{2}$ lb. cocoa @ 58¢.
 46. $3\frac{3}{4}$ lb. figs @ 24¢. 47. $7\frac{3}{4}$ lb. prunes @ 8¢.
 48. $3\frac{3}{4}$ lb. steak @ 16¢. 49. $27\frac{1}{4}$ yd. calico @ 12¢.
 50. $2\frac{1}{4}$ lb. chocolate @ 36¢.
 51. $3\frac{1}{2}$ lb. crackers @ 22¢.
 52. 3 lb. 8 oz. cereal @ 8¢.
 53. $25\frac{1}{2}$ -lb. bag of flour @ 4¢.
 54. $\frac{1}{8}$ is what part of $\frac{1}{4}$? of $\frac{1}{2}$? of 1? of 2? of 5?
 55. $\frac{1}{16}$ is what part of $\frac{1}{8}$? of $\frac{1}{4}$? of $\frac{1}{2}$? of 1? of 2?
 56. $\frac{1}{8}$ is what part of $\frac{1}{3}$? of 1? of 2? of 5? of 10?
 57. How much is $\frac{1}{2}$ of $\frac{1}{6}$? $\frac{1}{3}$ of $\frac{1}{8}$? $\frac{1}{6}$ of $\frac{1}{7}$? $\frac{1}{10}$ of $\frac{1}{3}$?
 58. Express $\frac{1}{6}$ as 20ths; $\frac{1}{6}$ as 12ths; $\frac{1}{10}$ as 100ths.
 59. Reduce to lowest terms: $\frac{1}{30}$, $\frac{5}{15}$, $\frac{7}{21}$, $\frac{8}{24}$, $\frac{6}{18}$.
 60. Multiply \$5.75 by 120; by 300; by 275.
 61. Add 16 ft. 8 in., 21 ft. 9 in., 3 ft. 7 in., 4 ft. 11 in., 5 ft. 10 in.
 62. How many cords of wood in a pile 96 ft. long, 6 ft. high, 4 ft. wide?
 63. How many square inches in a rectangle 3 yd. 2 in. long, and $2\frac{1}{2}$ ft. wide?

ORAL EXERCISE

State the cost of the following:

1. 4 hats @ \$1.50.
2. 8 books @ \$1.50.
3. 8 lamps @ \$1.25.
4. 40 sleds @ \$1.10.
5. 150 dolls @ $33\frac{1}{3}\%$.
6. 12 vases @ \$1.25.
7. 20 books @ \$1.05.
8. 35 jackets @ \$1.20.
9. 25 books @ \$1.20.
10. 12 chairs @ $\$1.33\frac{1}{3}$.
11. 9 frames @ $\$1.33\frac{1}{3}$.
12. 30 pictures @ \$1.05.
13. 30 baskets @ \$1.10.
14. 600 lb. butter @ $33\frac{1}{3}\%$.
15. 400 doz. eggs @ $12\frac{1}{2}\%$.
16. 800 qt. berries @ $12\frac{1}{2}\%$.

WRITTEN EXERCISE

Find the cost of the following:

1. 272 chairs @ \$1.50.
2. 478 books @ \$1.50.
3. 364 rugs @ \$1.25.
4. 154 lamps @ \$1.25.
5. 123 books @ $\$1.33\frac{1}{3}$.
6. 108 vases @ \$1.33.
7. 115 chairs @ \$1.20.
8. 205 clocks @ \$1.20.
9. 152 doz. eggs @ $12\frac{1}{2}\%$.
10. 116 lb. butter @ 25¢.

Make out bills for the following, as on page 237:

11. 3 lb. sugar @ $6\frac{1}{2}\%$, 3 gal. oil @ 17¢.
12. $2\frac{1}{2}$ doz. oranges @ 48¢, $\frac{1}{2}$ doz. bananas @ 24¢.
13. 25 arithmetics @ 30¢, 8 doz. tablets @ 36¢,
2 doz. bottles ink @ 94¢.
14. $12\frac{1}{2}$ yd. calico @ 14¢, $\frac{3}{4}$ yd. velvet @ \$1.60,
18 yd. embroidery @ $12\frac{1}{2}\%$.

15. If 1 cu. ft. of water weighs 62.5 lb., what is the weight of the water in a tank 6 ft. 6 in. long, 5 ft. wide, and 4 ft. deep?

TABLES FOR REFERENCE

LENGTH

12 inches (in.)	= 1 foot (ft.).
3 feet	= 1 yard (yd.).
$16\frac{1}{2}$ feet	= 1 rod (rd.).
5280 feet, or 320 rods	= 1 mile (mi.).

SQUARE MEASURE

144 square inches (sq. in.)	= 1 square foot (sq. ft.).
9 square feet	= 1 square yard (sq. yd.).
160 square rods (sq. rd.)	= 1 acre (A.).
640 acres	= 1 square mile (sq. mi.).

CUBIC MEASURE

1728 cubic inches (cu. in.)	= 1 cubic foot (cu. ft.).
27 cubic feet	= 1 cubic yard (cu. yd.).
128 cubic feet	= 1 cord (cd.).

A pile of wood 8 ft. by 4 ft. by 4 ft. contains 1 cord.

WEIGHT

16 ounces (oz.)	= 1 pound (lb.).
2000 pounds	= 1 ton (T.).
2240 pounds	= 1 long ton.

LIQUID MEASURE

4 gills (gi.)	= 1 pint (pt.).
2 pints	= 1 quart (qt.).
4 quarts	= 1 gallon (gal.).

DRY MEASURE

2 pints (pt.)	= 1 quart (qt.).
8 quarts	= 1 peck (pk.).
4 pecks	= 1 bushel (bu.).

TIME

60 seconds (sec.)	= 1 minute (min.).
60 minutes	= 1 hour (hr.).
24 hours	= 1 day (da.).
7 days	= 1 week (wk.).
365 days	= 1 year (yr.), except leap year.
30 or 31 days	= 1 month (mo.), except February.
12 months	= 1 year.

VALUE .

10 cents (ct. or ¢)	= 1 dime (d.).
10 dimes	= 1 dollar (\$).

A five-cent piece is often called a *nickel*.

MULTIPLICATION AND DIVISION

$1 \times 2 = 2$	$2 \div 2 = 1$	$1 \times 3 = 3$	$3 \div 3 = 1$
$2 \times 2 = 4$	$4 \div 2 = 2$	$2 \times 3 = 6$	$6 \div 3 = 2$
$3 \times 2 = 6$	$6 \div 2 = 3$	$3 \times 3 = 9$	$9 \div 3 = 3$
$4 \times 2 = 8$	$8 \div 2 = 4$	$4 \times 3 = 12$	$12 \div 3 = 4$
$5 \times 2 = 10$	$10 \div 2 = 5$	$5 \times 3 = 15$	$15 \div 3 = 5$
$6 \times 2 = 12$	$12 \div 2 = 6$	$6 \times 3 = 18$	$18 \div 3 = 6$
$7 \times 2 = 14$	$14 \div 2 = 7$	$7 \times 3 = 21$	$21 \div 3 = 7$
$8 \times 2 = 16$	$16 \div 2 = 8$	$8 \times 3 = 24$	$24 \div 3 = 8$
$9 \times 2 = 18$	$18 \div 2 = 9$	$9 \times 3 = 27$	$27 \div 3 = 9$
$10 \times 2 = 20$	$20 \div 2 = 10$	$10 \times 3 = 30$	$30 \div 3 = 10$
$11 \times 2 = 22$	$22 \div 2 = 11$	$11 \times 3 = 33$	$33 \div 3 = 11$
$12 \times 2 = 24$	$24 \div 2 = 12$	$12 \times 3 = 36$	$36 \div 3 = 12$
$13 \times 2 = 26$	$26 \div 2 = 13$	$13 \times 3 = 39$	$39 \div 3 = 13$
$14 \times 2 = 28$	$28 \div 2 = 14$	$14 \times 3 = 42$	$42 \div 3 = 14$
$15 \times 2 = 30$	$30 \div 2 = 15$	$15 \times 3 = 45$	$45 \div 3 = 15$

$1 \times 4 = 4$	$4 \div 4 = 1$	$1 \times 5 = 5$	$5 \div 5 = 1$
$2 \times 4 = 8$	$8 \div 4 = 2$	$2 \times 5 = 10$	$10 \div 5 = 2$
$3 \times 4 = 12$	$12 \div 4 = 3$	$3 \times 5 = 15$	$15 \div 5 = 3$
$4 \times 4 = 16$	$16 \div 4 = 4$	$4 \times 5 = 20$	$20 \div 5 = 4$
$5 \times 4 = 20$	$20 \div 4 = 5$	$5 \times 5 = 25$	$25 \div 5 = 5$
$6 \times 4 = 24$	$24 \div 4 = 6$	$6 \times 5 = 30$	$30 \div 5 = 6$
$7 \times 4 = 28$	$28 \div 4 = 7$	$7 \times 5 = 35$	$35 \div 5 = 7$
$8 \times 4 = 32$	$32 \div 4 = 8$	$8 \times 5 = 40$	$40 \div 5 = 8$
$9 \times 4 = 36$	$36 \div 4 = 9$	$9 \times 5 = 45$	$45 \div 5 = 9$
$10 \times 4 = 40$	$40 \div 4 = 10$	$10 \times 5 = 50$	$50 \div 5 = 10$
$11 \times 4 = 44$	$44 \div 4 = 11$	$11 \times 5 = 55$	$55 \div 5 = 11$
$12 \times 4 = 48$	$48 \div 4 = 12$	$12 \times 5 = 60$	$60 \div 5 = 12$
$13 \times 4 = 52$	$52 \div 4 = 13$	$13 \times 5 = 65$	$65 \div 5 = 13$
$14 \times 4 = 56$	$56 \div 4 = 14$	$14 \times 5 = 70$	$70 \div 5 = 14$
$15 \times 4 = 60$	$60 \div 4 = 15$	$15 \times 5 = 75$	$75 \div 5 = 15$

MULTIPLICATION AND DIVISION

$1 \times 6 = 6$	$6 + 6 = 12$	$1 \times 7 = 7$	$7 \div 7 = 1$
$2 \times 6 = 12$	$12 + 6 = 18$	$2 \times 7 = 14$	$14 \div 7 = 2$
$3 \times 6 = 18$	$18 + 6 = 24$	$3 \times 7 = 21$	$21 \div 7 = 3$
$4 \times 6 = 24$	$24 + 6 = 30$	$4 \times 7 = 28$	$28 \div 7 = 4$
$5 \times 6 = 30$	$30 + 6 = 36$	$5 \times 7 = 35$	$35 \div 7 = 5$
$6 \times 6 = 36$	$36 + 6 = 42$	$6 \times 7 = 42$	$42 \div 7 = 6$
$7 \times 6 = 42$	$42 + 6 = 48$	$7 \times 7 = 49$	$49 \div 7 = 7$
$8 \times 6 = 48$	$48 + 6 = 54$	$8 \times 7 = 56$	$56 \div 7 = 8$
$9 \times 6 = 54$	$54 + 6 = 60$	$9 \times 7 = 63$	$63 \div 7 = 9$
$10 \times 6 = 60$	$60 + 6 = 66$	$10 \times 7 = 70$	$70 \div 7 = 10$
$11 \times 6 = 66$	$66 + 6 = 72$	$11 \times 7 = 77$	$77 \div 7 = 11$
$12 \times 6 = 72$	$72 + 6 = 78$	$12 \times 7 = 84$	$84 \div 7 = 12$
$13 \times 6 = 78$	$78 + 6 = 84$	$13 \times 7 = 91$	$91 \div 7 = 13$
$14 \times 6 = 84$	$84 + 6 = 90$	$14 \times 7 = 98$	$98 \div 7 = 14$
$15 \times 6 = 90$		$15 \times 7 = 105$	$105 \div 7 = 15$

$1 \times 8 = 8$	$8 + 8 = 16$	$1 \times 9 = 9$	$9 \div 9 = 1$
$2 \times 8 = 16$	$16 + 8 = 24$	$2 \times 9 = 18$	$18 \div 9 = 2$
$3 \times 8 = 24$	$24 + 8 = 32$	$3 \times 9 = 27$	$27 \div 9 = 3$
$4 \times 8 = 32$	$32 + 8 = 40$	$4 \times 9 = 36$	$36 \div 9 = 4$
$5 \times 8 = 40$	$40 + 8 = 48$	$5 \times 9 = 45$	$45 \div 9 = 5$
$6 \times 8 = 48$	$48 + 8 = 56$	$6 \times 9 = 54$	$54 \div 9 = 6$
$7 \times 8 = 56$	$56 + 8 = 64$	$7 \times 9 = 63$	$63 \div 9 = 7$
$8 \times 8 = 64$	$64 + 8 = 72$	$8 \times 9 = 72$	$72 \div 9 = 8$
$9 \times 8 = 72$	$72 + 8 = 80$	$9 \times 9 = 81$	$81 \div 9 = 9$
$10 \times 8 = 80$	$80 + 8 = 88$	$10 \times 9 = 90$	$90 \div 9 = 10$
$11 \times 8 = 88$	$88 + 8 = 96$	$11 \times 9 = 99$	$99 \div 9 = 11$
$12 \times 8 = 96$	$96 + 8 = 104$	$12 \times 9 = 108$	$108 \div 9 = 12$
$13 \times 8 = 104$	$104 + 8 = 112$	$13 \times 9 = 117$	$117 \div 9 = 13$
$14 \times 8 = 112$	$112 + 8 = 120$	$14 \times 9 = 126$	$126 \div 9 = 14$
$15 \times 8 = 120$		$15 \times 9 = 135$	$135 \div 9 = 15$

MULTIPLICATION AND DIVISION

$1 \times 10 = 10$	$10 \div 10 = 1$	$1 \times 11 = 11$	$11 \div 11 = 1$
$2 \times 10 = 20$	$20 \div 10 = 2$	$2 \times 11 = 22$	$22 \div 11 = 2$
$3 \times 10 = 30$	$30 \div 10 = 3$	$3 \times 11 = 33$	$33 \div 11 = 3$
$4 \times 10 = 40$	$40 \div 10 = 4$	$4 \times 11 = 44$	$44 \div 11 = 4$
$5 \times 10 = 50$	$50 \div 10 = 5$	$5 \times 11 = 55$	$55 \div 11 = 5$
$6 \times 10 = 60$	$60 \div 10 = 6$	$6 \times 11 = 66$	$66 \div 11 = 6$
$7 \times 10 = 70$	$70 \div 10 = 7$	$7 \times 11 = 77$	$77 \div 11 = 7$
$8 \times 10 = 80$	$80 \div 10 = 8$	$8 \times 11 = 88$	$88 \div 11 = 8$
$9 \times 10 = 90$	$90 \div 10 = 9$	$9 \times 11 = 99$	$99 \div 11 = 9$
$10 \times 10 = 100$	$100 \div 10 = 10$	$10 \times 11 = 110$	$110 \div 11 = 10$
$11 \times 10 = 110$	$110 \div 10 = 11$	$11 \times 11 = 121$	$121 \div 11 = 11$
$12 \times 10 = 120$	$120 \div 10 = 12$	$12 \times 11 = 132$	$132 \div 11 = 12$
$13 \times 10 = 130$	$130 \div 10 = 13$	$13 \times 11 = 143$	$143 \div 11 = 13$
$14 \times 10 = 140$	$140 \div 10 = 14$	$14 \times 11 = 154$	$154 \div 11 = 14$
$15 \times 10 = 150$	$150 \div 10 = 15$	$15 \times 11 = 165$	$165 \div 11 = 15$

$1 \times 12 = 12$	$12 \div 12 = 1$	$1 \times 13 = 13$	$13 \div 13 = 1$
$2 \times 12 = 24$	$24 \div 12 = 2$	$2 \times 13 = 26$	$26 \div 13 = 2$
$3 \times 12 = 36$	$36 \div 12 = 3$	$3 \times 13 = 39$	$39 \div 13 = 3$
$4 \times 12 = 48$	$48 \div 12 = 4$	$4 \times 13 = 52$	$52 \div 13 = 4$
$5 \times 12 = 60$	$60 \div 12 = 5$	$5 \times 13 = 65$	$65 \div 13 = 5$
$6 \times 12 = 72$	$72 \div 12 = 6$	$6 \times 13 = 78$	$78 \div 13 = 6$
$7 \times 12 = 84$	$84 \div 12 = 7$	$7 \times 13 = 91$	$91 \div 13 = 7$
$8 \times 12 = 96$	$96 \div 12 = 8$	$8 \times 13 = 104$	$104 \div 13 = 8$
$9 \times 12 = 108$	$108 \div 12 = 9$	$9 \times 13 = 117$	$117 \div 13 = 9$
$10 \times 12 = 120$	$120 \div 12 = 10$	$10 \times 13 = 130$	$130 \div 13 = 10$
$11 \times 12 = 132$	$132 \div 12 = 11$	$11 \times 13 = 143$	$143 \div 13 = 11$
$12 \times 12 = 144$	$144 \div 12 = 12$	$12 \times 13 = 156$	$156 \div 13 = 12$
$13 \times 12 = 156$	$156 \div 12 = 13$	$13 \times 13 = 169$	$169 \div 13 = 13$
$14 \times 12 = 168$	$168 \div 12 = 14$	$14 \times 13 = 182$	$182 \div 13 = 14$
$15 \times 12 = 180$	$180 \div 12 = 15$	$15 \times 13 = 195$	$195 \div 13 = 15$

MULTIPLICATION AND DIVISION

$1 \times 14 = 14$	$14 + 14 = 1$	$1 \times 15 = 15$	$15 \div 15 = 1$
$2 \times 14 = 28$	$28 + 14 = 2$	$2 \times 15 = 30$	$30 \div 15 = 2$
$3 \times 14 = 42$	$42 + 14 = 3$	$3 \times 15 = 45$	$45 \div 15 = 3$
$4 \times 14 = 56$	$56 + 14 = 4$	$4 \times 15 = 60$	$60 \div 15 = 4$
$5 \times 14 = 70$	$70 + 14 = 5$	$5 \times 15 = 75$	$75 \div 15 = 5$
$6 \times 14 = 84$	$84 + 14 = 6$	$6 \times 15 = 90$	$90 \div 15 = 6$
$7 \times 14 = 98$	$98 + 14 = 7$	$7 \times 15 = 105$	$105 \div 15 = 7$
$8 \times 14 = 112$	$112 + 14 = 8$	$8 \times 15 = 120$	$120 \div 15 = 8$
$9 \times 14 = 126$	$126 + 14 = 9$	$9 \times 15 = 135$	$135 \div 15 = 9$
$10 \times 14 = 140$	$140 + 14 = 10$	$10 \times 15 = 150$	$150 \div 15 = 10$
$11 \times 14 = 154$	$154 + 14 = 11$	$11 \times 15 = 165$	$165 \div 15 = 11$
$12 \times 14 = 168$	$168 + 14 = 12$	$12 \times 15 = 180$	$180 \div 15 = 12$
$13 \times 14 = 182$	$182 + 14 = 13$	$13 \times 15 = 195$	$195 \div 15 = 13$
$14 \times 14 = 196$	$196 + 14 = 14$	$14 \times 15 = 210$	$210 \div 15 = 14$
$15 \times 14 = 210$	$210 + 14 = 15$	$15 \times 15 = 225$	$225 \div 15 = 15$

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ANSWERS

Answers are given to the Written Exercises only, beginning on page 39.

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1. 55.	2. 92.	3. 89.	4. 79.	5. 88.
6. 77.	7. 68.	8. 89.	9. 99.	10. 98.
11. 68.	12. 58.	13. 78.	14. 79.	15. 88.
16. 89.	17. 77.	18. 76.	19. 78.	20. 98.
21. 88.	22. 78.	23. 98.	24. 88.	25. 39.
26. 36.	27. 78.	28. 39.	29. 46.	30. 47.
31. 77.	32. 69.	33. 58.	34. 23.	35. 19.
36. 16.	37. 19.	38. 22.	39. 18.	40. 15.
41. 16.	42. 15.	43. 30.	44. 76.	

Page 40

1. 36.	2. 48 ct.	3. 48.	4. 10 ct.
5. 6 qt.	6. 21 ft.	7. 49 lb.	8. \$15.
9. 77 lb.	10. 17.	11. 21.	12. \$38.
13. \$65.	14. \$68.	15. 38 boys.	16. 37 girls.
17. 47.	18. 87.	19. 89.	20. 108.
21. 77.	22. 98.	23. 49.	

Page 41

1. 25.	2. 43.	3. 62.	4. 40.	5. 34.	6. 11.
7. 32.	8. 41.	9. 13.	10. 41.	11. 20.	12. 11.

Page 42

1. 16.	2. 37.	3. 75.	4. 57 ct.
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Page 43

1. 22.	2. 12.	3. 21.	4. 16.	5. 41.
6. 81.	7. 31.	8. 16.	9. 11.	10. 35.
11. 61.	12. 71.	13. 43.	14. 61.	15. 16.
16. 10.	17. 60.	18. 10.	19. 10.	20. 12.
21. 10.	22. 12.	23. 80.	24. 33.	25. 30.
26. 11.	27. 20.	28. 20.	29. 40.	30. 12.
31. 21.	32. 30.	33. 25.	34. 17.	35. 46.
36. 16.	37. 66.	38. 70.	39. 71.	40. 14.
41. 20.	42. 10.	43. 30.	44. 11.	45. 33.
46. 42.	47. 33.	48. 81.	49. 52.	50. 22.
51. 15.	52. 62.	53. 66.	54. 48.	55. 71.
56. 31.	57. 51.	58. 62.	59. 30.	60. 1.
61. 40.	62. 1.	63. 61.	64. 34.	65. 20.
66. 40.	67. 24, 18.	68. 66.	69. 33.	70. 71.

Page 44

1. 41 ct.	2. 6.	3. 21.	4. 31.	5. 16.
6. 60.	7. 70.	8. 44.	9. 53.	10. 21 ft.
11. 70 ct.	12. 62.	13. 50 ct.	14. 62 ft.	15. 52.
16. 3 yd.	17. 70 yd.	18. 42.	19. 3.	20. 6.
21. 14.	22. 37.	23. 60.	24. 42.	25. 60.
26. 73.	27. 58.	28. 61.	29. 26.	30. 11.
31. 2.	32. 3.	33. 4.	34. 13.	35. 30.
36. 40.	37. 53.	38. 23.	39. 33.	40. 75.
41. 53.	42. 55.	43. 38.	44. 47.	45. 39.
46. 80.	47. 76.	48. 71.	49. 21.	50. 1.
51. 21.	52. 62.	53. 81.	54. 51.	

Page 47

1. 3, 30, 2, 20, 1, 10, 4, 40, 2, 20, 1, 10.
2. 95 ct., 69 lb., 78 qt., \$78.

Page 54

1. 958, 886, 644, 788. 2. 452, 472, 282, 513.

Page 55

1. 32 ft., 333 ft., 9 in., 33 ft., 337 ft.
2. 29 ft., 229 ft., 3 in., 25 ft., 225 ft.

Page 56

1. 9 lb., 90 lb., 900 lb., 935 lb.
2. 5 lb., 50 lb., 500 lb., 512 lb.

Page 57

1. 46 lb. 10 oz. 2. 85 lb. 12 oz.

Page 58

- | | | | |
|-------------|-------------|--------------|------------|
| 1. 676. | 2. 888. | 3. 799. | 4. 695. |
| 5. 869. | 6. 787. | 7. 788. | 8. 558. |
| 9. 888. | 10. 797. | 11. 487. | 12. 798. |
| 13. 888. | 14. 678. | 15. 648. | 16. \$466. |
| 17. 378 in. | 18. 758 ft. | 19. 1099 ft. | 20. \$386. |
| 21. 377 lb. | 22. 388 lb. | 23. 296 yd. | 24. \$444. |
| 25. \$888. | 26. 617 yd. | 27. \$777. | 28. \$566. |

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- | | | | |
|-------------|-------------|-------------|-------------|
| 1. 305. | 2. 411. | 3. 223. | 4. 514. |
| 5. 635. | 6. 414. | 7. 355. | 8. 453. |
| 9. 227. | 10. 651. | 11. 871. | 12. 922. |
| 13. 822. | 14. 75. | 15. 573. | 16. 139. |
| 17. 331. | 18. \$477. | 19. \$252. | 20. \$355. |
| 21. \$376. | 22. \$475. | 23. \$756. | 24. \$500. |
| 25. \$650. | 26. \$820. | 27. \$233. | 28. 188 ft. |
| 29. 496 ft. | 30. 166 yd. | 31. 139 in. | 32. 105. |
| 33. 102. | 34. 22. | 35. 11. | 36. 110. |
| | | | 37. 110. |

Page 61

1. 10 pt., 5 qt. 2. 8 qt., 2 gal. 3. 10 bu., 10 gal.

Page 63

1. 7 da. 2. 60 sec., 1 min. 3. 60 sec., 1 min.

Page 64

1. 6 sq. in., 10 sq. ft., 30 sq. in., 25 sq. ft.

Page 79

- | | | | | |
|----------|----------|----------|----------|----------|
| 1. 65. | 2. 75. | 3. 87. | 4. 74. | 5. 80. |
| 6. 81. | 7. 92. | 8. 76. | 9. 83. | 10. 83. |
| 11. 128. | 12. 189. | 13. 239. | 14. 147. | 15. 206. |
| 16. 175. | 17. 178. | 18. 188. | 19. 148. | 20. 129. |

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- | | | | | |
|---------|---------|---------|---------|----------|
| 1. 80. | 2. 91. | 3. 68. | 4. 63. | 5. 77. |
| 6. 383. | 7. 767. | 8. 760. | 9. 831. | 10. 960. |

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- | | | | | |
|---------|---------|---------|-----------|------------|
| 1. 469. | 2. 473. | 3. 503. | 4. 613. | 5. 712 ft. |
| | 6. 671. | 7. 861. | 8. \$922. | |

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- | | | | |
|-------------|-------------|-------------|-------------|
| 1. 836. | 2. 868. | 3. 832. | 4. 909. |
| 5. 725. | 6. 464. | 7. 927. | 8. 437. |
| 9. 910. | 10. 418. | 11. 696. | 12. 770. |
| 13. 500. | 14. 888. | 15. 600. | 16. \$300. |
| 17. \$900. | 18. \$650. | 19. \$700. | 20. 440 ft. |
| 21. 761 ft. | 22. 500 yd. | 23. 404 yd. | 24. 154 lb. |
| | 25. 245 lb. | 26. 247 lb. | |

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- | | | | | |
|-------------|-------------|-------------|-------------|-------------|
| 1. 958. | 2. 957. | 3. 745. | 4. 955. | 5. 836. |
| 6. 208. | 7. 199. | 8. 228. | 9. 226. | 10. 219. |
| 11. 238. | 12. 469. | 13. 626. | 14. 531. | 15. 710. |
| 16. 690. | 17. 905. | 18. 704. | 19. 504. | 20. 805. |
| 21. 339. | 22. 759. | 23. 667. | 24. 646. | 25. 325. |
| 26. 528. | 27. \$783. | 28. \$665. | 29. \$867. | 30. 165 in. |
| 31. 129 qt. | 32. 373 ft. | 33. 423 ft. | 34. 629 ft. | 35. 101 yd. |

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|---------|---------|-----------|------------|-------------|----------|
| 1. 109. | 2. 202. | 3. \$137. | 4. 295 ft. | 5. 189 min. | |
| 6. 192. | 7. 280. | 8. 174. | 9. 694. | 10. 215. | 11. 211. |

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|--------------|-------------|-------------|-------------|----------|
| 1. 217. | 2. 264. | 3. 396. | 4. 598. | |
| 5. 280. | 6. 789. | 7. 306. | 8. 19. | |
| 9. 198. | 10. 494. | 11. 399. | 12. 109. | |
| 13. 299. | 14. 79. | 15. 352. | 16. 494. | |
| 17. 188. | 18. 496. | 19. 84. | 20. 81. | |
| 21. 165. | 22. \$136. | 23. \$250. | 24. \$575. | |
| 25. 233 ft. | 26. 155 ft. | 27. 255 yd. | 28. 187 yd. | |
| 29. 268 min. | 30. 52 ft. | 31. 781 ft. | 32. 605. | |
| 33. 745. | 34. 570. | 35. 199. | 36. 708. | |
| 37. 558. | 38. 578. | 39. 289. | 40. 345. | |
| 41. 448. | 42. \$557. | 43. \$167. | 44. 428. | |
| 45. 619. | 46. 143. | 47. 249. | 48. 563. | 49. 215. |

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|---------|----------|---------|---------|---------|---------|
| 1. 69. | 2. 92. | 3. 50. | 4. 75. | 5. 90. | |
| 6. 51. | 7. 39. | 8. 114. | 9. 57. | 10. 54. | |
| 11. 84. | 12. 111. | 13. 92. | 14. 72. | 15. 48. | 16. 56. |

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|-------------|------------|------------|-------------|-------------|
| 1. 52. | 2. 74. | 3. 96. | 4. 78. | 5. 94. |
| 6. 45. | 7. 72. | 8. 78. | 9. 87. | 10. 84. |
| 11. 68. | 12. 76. | 13. 100. | 14. 132. | 15. 144. |
| 16. 75. | 17. 85. | 18. 130. | 19. 160. | 20. 185. |
| 21. 135. | 22. 156. | 23. 272. | 24. 292. | 25. 410. |
| 26. 182. | 27. 178. | 28. 279. | 29. 380. | 30. 480. |
| 31. 70. | 32. 90 ct. | 33. 132. | 34. 132 | 35. 310. |
| 36. \$150. | 37. \$165. | 38. \$128. | 39. 355 ft. | 40. 100 ct. |
| 41. 164 lb. | | 42. 99 yd. | | |

Page 89

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|----------|----------|----------|------------|
| 1. \$34. | 2. \$96. | 3. \$42. | 4. 150 ct. |
|----------|----------|----------|------------|

Page 90

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|----------|----------|----------|------------|----------|
| 1. 21. | 2. 12. | 3. 11. | 4. 34. | 5. 32. |
| 6. 11. | 7. 124. | 8. 232. | 9. 211. | 10. 112. |
| 11. 110. | 12. 101. | 13. 213. | 14. 103. | 15. 322. |
| | 16. 313. | 17. 231. | 18. 112. | |
| | 19. 200. | 20. 100. | 21. 4, 40. | |

Page 92

- | | |
|-------------|------------|
| 1. 180 min. | 2. 90 min. |
|-------------|------------|

Page 93

1. XX, XII, VII, VI, XVIII, XVI, XIX, XV.
2. 11, 9, 4, 6, 19, 14, 17.

Page 94

1. 2345, 7890, 6789.
2. Two thousand one hundred forty-three; nine thousand nine; nine thousand eight hundred seventy-six.

Page 95

1. IV, XLII, LXXIII, LXXV, LXXIX, LXXXIV, LXXXIX.

2. 39, 44, 79, 88.

Page 96

\$1.05, \$7.16, \$925.25, \$17.50.

Page 97

1. 4.

2. \$1, \$4.

Page 98

1. \$3.20.

2. \$7.30.

3. \$8.

4. \$6.13.

Page 99

1. 180° .

2. 66° .

3. 16° .

4. 47° .

Page 100

1. 38 ft.

3. $2\frac{1}{2}$ in.

Page 101

1. 16 sq. in. 2. 4 sq. ft. 3. 6 sq. yd. 4. 3 in., 9 sq. in.

Page 102

1. 270 sq. yd.

2. 270 sq. ft.

3. 170 sq. yd.

Page 105

1. 45 cu. in.

2. 88 cu. ft.

3. 96 cu. ft.

4. 90 cu. in., 126 sq. in. 5. 96 cu. in., 104 sq. in.

Page 106

1. $\frac{2}{3}$, $\frac{3}{4}$.

2. 12, 6, 20, 15.

Page 108

1. 284.

2. 220.

3. 528.

4. 1012.

5. 570.

6. 5857. 7. 5795. 8. 2112. 9. \$8.85. 10. \$10.11.

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- | | | | | |
|----------|----------|----------|-------------|--------------|
| 1. 4428. | 2. 4412. | 3. 4172. | 4. \$37.72. | 5. \$31.21. |
| 6. 2359. | 7. 2623. | 8. 3318. | 9. \$82.68. | 10. \$43.92. |

Page 110

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|--------------|-------------|--------------|-------------|
| 1. 2829. | 2. 5403. | 3. 7062. | 4. 7636. |
| 5. 5979. | 6. 7103. | 7. 7661. | 8. 7631. |
| 9. 8993. | 10. 6877. | 11. 7920 ft. | 12. \$7125. |
| 13. 9240 ft. | 14. \$4575. | 15. \$4860. | 16. \$5920. |
| 17. 6129. | 18. 5469. | 19. 6878. | 20. \$725. |
| 21. \$515. | 22. \$442. | 23. \$748. | 24. \$363. |
| 25. \$275. | 26. 1888. | 27. 1079. | 28. 1572. |
| 29. 1188. | 30. 805. | 31. 358. | 32. 1627. |
| 33. 975. | 34. 761. | 35. 1838. | 36. 1005. |
| 37. 989. | 38. 3485. | 39. 82. | 40. 1067. |
| 41. 4250. | 42. 404. | 43. 2581. | 44. 5009. |
| | 45. 223. | 46. 2192. | |

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|-------------|-------------|-------------|-------------|-------------|
| 1. 34. | 2. 43. | 3. 32. | 4. 22. | 5. 13. |
| 6. 21. | 7. 12. | 8. 20. | 9. 21. | 10. 11. |
| 11. 100. | 12. 110. | 13. 122. | 14. 124. | 15. 433. |
| 16. 201. | 17. 303. | 18. 202. | 19. 198. | 20. 192. |
| 21. 385. | 22. 1039. | 23. 1096. | 24. 396. | 25. 1711. |
| 26. 1089. | 27. 3497. | 28. 109. | 29. 2047. | 30. 5928. |
| 31. 1825. | 32. 991. | 33. 4052. | 34. 2707. | 35. 6901. |
| 36. \$3060. | 37. \$7913. | 38. \$8.51. | 39. \$7.63. | 40. \$4.94. |
| 41. \$6.74. | 42. \$6.11. | 43. \$6.17. | 44. 9216. | 45. 2969. |
| 46. 2631. | 47. 4272. | 48. 2676. | 49. 1451. | 50. 3115. |
| | 51. 6427. | 52. 3850. | | |

Page 113

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|-----------------------------|-----------------------------|
| 2. 240, 246, 306, 420, 486. | 3. \$6, 7 ft., 9 ct., 8 yd. |
|-----------------------------|-----------------------------|

Page 114

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|---------|---------|---------|---------|------------|
| 1. 36. | 2. 20. | 3. 22. | 4. 25. | 5. 22. |
| 6. 32. | 7. 30. | 8. 30. | 9. 20. | 10. 39. |
| 11. 44. | 12. 54. | 13. 24. | 14. 29. | 15. 34. |
| 16. 52. | 17. 36. | 18. 39. | 19. 78. | 20. 30. |
| 21. 49. | 22. 37. | 23. 60. | 24. 85. | 25. 53 ct. |
| | 26. 30. | | 27. 27. | |

Page 115

2. 210, 427, 301, 175, 168, 245, 644, 469, 343.
3. 9, 6, \$8, 4 ft., 7 in., 10 yd. 4. 30.

Page 117

2. 270, 333, 603, 243, 414, 441.
3. \$9, 10 ft., 7 in., 6 bu. 4. 5 yd.

Page 121

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|---------|-----------|---------|-----------|-----------|
| 1. 315. | 2. 432. | 3. 609. | 4. 576. | 5. 686. |
| 6. 704. | 7. 765. | 8. 441. | 9. 630. | 10. 1722. |
| | 11. 2849. | | 12. 6616. | |

Page 122

1. 8 lb. 2. \$1.84.

Page 123

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|---------|-----------|----------|-----------|----------|
| 1. 55. | 2. 75. | 3. 137. | 4. 81. | 5. 92. |
| 6. 124. | 7. 132. | 8. 119. | 9. 122. | 10. 102. |
| 11. 93. | 12. 79. | 13. 370. | 14. 470. | 15. 991. |
| | 16. 1426. | 17. 256. | 18. 1147. | |

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|---------|----------|-----------|----------|
| 1. 811. | 2. 822. | 3. 872. | 4. 1287. |
| 5. 137. | 6. 1401. | 7. \$125. | 8. 28. |

Page 126

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|-------------|-----------------------------|
| 1. 15. | 2. 900, 10,800. |
| 3. 730 gal. | 4. 40 ct., \$2.80, \$11.20. |

Page 127

- | | | | |
|---------------|--------------|------------|-------------|
| 1. \$2091.50. | 2. \$117.45. | 3. \$3900. | 4. \$87.20. |
|---------------|--------------|------------|-------------|

Page 128

- | | | | |
|---------------|---------------|---------------|---------------|
| 1. \$5426.73. | 2. \$6727.65. | 3. \$2431.10. | 4. \$1940.32. |
| 5. \$8491.60. | 6. \$7818.47. | 7. 794. | 8. 1906. |
| 9. 99. | 10. 1516. | 11. \$37.18. | 12. \$38.87. |
| 13. \$39.09. | 14. \$364.39. | 15. \$2982. | 16. \$2943. |
| 17. \$2315. | 18. \$2120. | 19. 2538 ft. | 20. 2512 yd. |
| 21. 716. | 22. 623. | 23. 858. | 24. 1233. |
| 25. 1370½. | 26. 1787½. | | |

Page 130

1. DLXII, DCCXLIII, DCCCXXVII, CCCXXIX, CL
2. 323, 459, 777, 401, 808.

Page 131

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|-------------|-------------|--------------|
| 1. \$16.93. | 2. \$62.45. | 3. \$605.25. |
|-------------|-------------|--------------|

Page 132

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|--------------|-------------|---------------|---------------|
| 1. \$16.11. | 2. \$17.10. | 3. \$172.25. | 4. \$110.11. |
| 5. \$287.95. | 6. \$81.77. | 7. \$1053.25. | 8. \$1311.20. |

Page 133

- | | | |
|--------------|-------------|-------------|
| 1. \$17.85. | 2. \$18.50. | 3. \$69.60. |
| 4. \$128.25. | 5. \$225. | 6. \$438. |

Page 134

- | | | | |
|-------------|-------------|-------------|------------|
| 1. \$47.49. | 2. \$16.87. | 3. \$17.78. | 4. \$4.89. |
| 5. \$29.92. | 6. 545. | 7. 6489. | 8. 2892. |

ANSWERS**11**

- | | | | |
|--------------|---------------|--------------|--------------|
| 9. 92. | 10. 7849. | 11. 1340 ft. | 12. 873 yd. |
| 13. 5959 lb. | 14. 1877 gal. | 15. \$889. | 16. 8541. |
| 17. 2413. | 18. 3939. | 19. 969. | 20. 1764. |
| 21. \$3.88. | 22. \$34.25. | 23. \$53.73. | 24. \$23.22. |

Page 136

- | | | | |
|-------------|--------------|-------------|--------------|
| 1. \$11.25. | 2. \$9. | 3. \$14.25. | 4. \$89.52. |
| 5. \$9640. | 6. \$80.37. | 7. \$21.14. | 8. \$187.68. |
| 9. \$96.40. | 10. \$73.50. | 11. \$5.81. | |

Page 137

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|-------------------|----------------------------|------------|-----------|
| 1. \$3. | 2. \$3.50. | 3. \$2.40. | 4. 60 ct. |
| 5. 270, 270, 540. | 6. \$3.50, 70 ct., \$4.20. | | |

Page 139

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|------------|------------|-------------|------------|
| 1. 1651. | 2. 8442. | 3. 11,200. | 4. 8820. |
| 5. 13,314. | 6. 10,191. | 7. 8890. | 8. 5742. |
| 9. 7562. | 10. 8643. | 11. \$7425. | 12. \$216. |

Page 140

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|-----------------------|-----------------|-------------|-------------|--------------|
| 1. \$72.30. | 2. \$71.94. | 3. \$77.71. | 4. \$83.16. | 5. \$106.78. |
| 6. \$54.21. | 7. \$80.73. | 8. \$59.50. | 9. \$49.68. | 10. \$24. |
| 11. \$48, \$18, \$66. | 12. \$12, \$48. | 13. \$98. | | |

Page 141

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|-----------------|-----------------|------------|-----------------|
| 1. 7800 sq. ft. | 2. 7800 cu. ft. | 3. 558 lb. | 4. 1950 cu. ft. |
|-----------------|-----------------|------------|-----------------|

Page 142

- | | | | |
|----------|---------|------------|-------------------|
| 1. \$81. | 2. 189. | 3. \$788. | 4. \$972. |
| 5. 690. | 6. 429. | 7. 71 bbl. | 8. \$800, \$5600. |

Page 143

- | | | | |
|------------|---------------------|----------------------|------------|
| 1. \$2.16. | 2. \$4.32. | 3. \$9.31. | 4. \$2.05. |
| 5. \$4.16. | 6. \$6.05. | 7. \$36.25. | 8. \$2.20. |
| 9. \$1.44. | 10. \$27.50, \$275. | 11. \$4.50, \$22.50. | |

Page 144

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|---------|------------|---------|---------|---------|
| 1. 21. | 2. 2. | 3. 350. | 4. 6. | 5. 15. |
| 6. 320. | 7. 37. | 8. 19. | 9. 91. | 10. 37. |
| 11. 15. | 12. \$123. | 13. 46. | 14. 59. | 15. 38. |

Page 145

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|---------|----------|--------|---------|--------|
| 1. 270. | 2. 3024. | 3. 42. | 4. 231. | 5. 24. |
|---------|----------|--------|---------|--------|

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|---------|---------|---------|---------|---------|
| 1. 21. | 2. 51. | 3. 71. | 4. 112. | 5. 342. |
| 6. 876. | 7. 486. | 8. 546. | 9. 647. | |

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|----------|----------|---------|----------|----------|
| 1. 235. | 2. 126. | 3. 347. | 4. 158. | 5. 119. |
| 6. 218. | 7. 125. | 8. 118. | 9. 119. | 10. 99. |
| 11. 111. | 12. 123. | 13. 89. | 14. 111. | 15. 117. |
| 16. 35. | 17. 19. | 18. 21. | | |

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|---------|---------|---------|---------|---------|
| 1. 403. | 2. 503. | 3. 402. | 4. 102. | 5. 532. |
| 6. 111. | 7. 120. | 8. 51. | 9. 102. | |

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|---------|---------|---------|---------|---------|
| 1. 213. | 2. 350. | 3. 240. | 4. 210. | 5. 130. |
| 6. 111. | 7. 180. | 8. 73. | 9. 92. | |

Page 151

1. \$1.82. 2. 45 ct. 3. \$1.35. 4. \$1.88.

Page 153

2. 1 yd. 3. 30 ct. 4. 15 in. 5. $1\frac{1}{2}$ yd. 6. 25 ct.

Page 155

1. 243, 486. 2. 209, 418, 627.
3. 47, 94, 141, 188. 4. 122, 244, 366, 488.
5. 18 mi., 12 mi.

Page 156

4. 1278, $672\frac{1}{2}$, $249\frac{5}{8}$, $314\frac{3}{4}$.

Page 157

1. 55 ct. 2. 95 ct.
3. \$1.11 $\frac{3}{4}$, \$1.50, \$1.70, \$0.95.
4. \$0.50, \$0.20, \$0.80, \$387.88.

Page 158

1. 4 oz., 8 oz. 2. $\frac{1}{2}$ lb., $\frac{3}{4}$ lb., 1 lb., $1\frac{1}{2}$ lb., $1\frac{3}{4}$ lb., 2 lb.
3. 25 ct., 50 ct., 75 ct., \$1.25. 4. \$20, \$60, \$80.

Page 159

1. $226\frac{1}{2}$. 2. $449\frac{3}{4}$. 3. $279\frac{1}{2}$. 4. $90\frac{3}{4}$. 5. $249\frac{1}{2}$.
6. $134\frac{1}{4}$. 7. $345\frac{1}{4}$. 8. $438\frac{1}{4}$. 9. 44 sq. in.

Page 160

1. 640. 2. 666. 3. 243. 4. 423. 5. 540.
6. 687. 7. 609. 8. 296. 9. 338. 10. 470.
11. 534. 12. 582. 13. 616. 14. 489. 15. 391.
16. 105. 17. $497\frac{1}{4}$. 18. $65\frac{1}{2}$. 19. $355\frac{1}{2}$. 20. $85\frac{1}{2}$.

21. $341\frac{1}{2}$.	22. $77\frac{1}{2}$.	23. $95\frac{1}{2}$.	24. 92.	25. $797\frac{1}{2}$.
26. 89.	27. $25\frac{1}{2}$.	28. $166\frac{1}{2}$.	29. $199\frac{1}{2}$.	30. 123.
31. $115\frac{1}{2}$.	32. 223.	33. $207\frac{1}{2}$.	34. 96 cu. in.	35. 170.
36. 297.	37. 384.	38. 216.	39. 384.	40. 385.
41. 208.	42. $413\frac{1}{2}$.	43. $126\frac{1}{2}$.	44. $204\frac{1}{2}$.	45. $140\frac{1}{2}$.
46. 39.	47. 39.	48. 39.	49. 49.	50. 71.
51. 41.	52. 32.	53. 57.	54. 29.	55. 72.

Page 161

1. 3600 sq. in. 2. 333 sq. ft. 3. 16, 16, 16 sq. yd.
 4. 240 sq. yd. 5. $166\frac{1}{2}$ sq. ft., 3654 sq. yd., 1936 sq. ft.

Page 162

1. \$165.75 2. \$187. 3. \$6.10.

Page 163

1. 4000 lb., 6000 lb.	2. 171 sq. ft.	3. 2448 sq. ft.
4. 192 sq. yd.	5. 81 sq. yd.	6. 108 sq. yd.
7. 432 sq. yd.	8. 171 sq. yd.	9. 576 sq. yd.
10. 174 sq. yd.	11. 1452 sq. yd.	12. 11,136.
13. 7527.	14. 10,397.	15. 9536.
16. 9207.	17. 5797.	18. 8892.
19. 8175.	20. 9174.	21. 8778.
22. 8928.	23. 7123.	24. 8832.
25. 10,449.	26. 9751.	27. \$46.99.
28. \$62.51.	29. \$74.24.	30. \$69.12.
31. 571.	32. 491.	33. 541.
34. 693.	35. $254\frac{1}{2}$.	36. $670\frac{1}{2}$.
37. \$2.55.	38. $\$5.44\frac{1}{2}$.	39. \$2.75.
40. $\$2.54\frac{1}{2}$.	41. 25.	42. 181.
43. 89.	44. 19.	45. 75.
46. 68.		

Page 164

1. 28, 216, 2. 2. 8, 6, 4. 3. \$26. 4. \$11.

Page 165

1. 66 ft. 2. 300 ft. 3. 390 lb., 6. 4. 54,000 gal.

Page 166

1. 9, 27. 2. 30.
3. 16 oz., 32 oz., 4 oz. 4. 4 tumblers, 2 gills.

Page 167

3. 180 da.

Page 169

1. 10. 2. 36,550. 3. 731, 16. 4. \$160.

Page 170

1. 6946. 2. 7211. 3. \$192.98. 4. \$187.78.
5. \$202.95. 6. \$772.68. 7. \$225.52. 8. 19,318.
9. 38,418. 10. 20,584. 11. 144. 12. 26.
13. 125. 14. 41. 15. $33\frac{3}{4}$. 16. $71\frac{1}{4}$.
17. $43\frac{1}{4}$. 18. $23\frac{1}{4}$. 19. $26\frac{1}{4}$. 20. $19\frac{1}{4}$.
21. $24\frac{1}{4}$. 22. 360, 240, 480, 180, 540.
23. 288, 576, 864, 1152, 240, 1200.
24. 110, 148, 314, 348. 25. 220, 272, 628, 3680.
26. 480, 570, 84, 2430. 27. 252, 405, 495, 2583.

Page 172

1. 40,404, 70,747, 64,788, 98,765, 50,005, 66,666, 10,010.

Page 173

1. \$7456. 2. \$13,846. 3. \$32,320. 4. \$30,419.
5. \$236. 6. \$129. 7. \$108. 8. \$88.
9. \$309. 10. \$209.

Page 175

1. \$956.40. 2. \$713.75. 3. \$1626.97. 4. \$875.68.
5. \$1015.34. 6. \$635.01. 7. \$907.64. 8. \$1247.08.

9. \$823.68. 10. \$1078.58. 11. \$812.97. 12. \$1123.63.
13. \$1042.27. 14. \$1208.99. 15. \$2493.80. 16. \$1290.95.
17. \$1147.15. 18. \$857.98. 19. \$722.18. 20. \$953.87.

Page 177

1. \$146.40. 2. \$483.73. 3. \$190.70. 4. \$317.88.
5. \$294.98. 6. \$326.26. 7. \$89.32. 8. \$123.14.
9. \$523.96. 10. \$221.88. 11. \$299.83. 12. \$168.99.
13. \$92.84. 14. \$185.36. 15. \$99.13. 16. \$98.92.
17. \$86.89. 18. \$551.25. 19. \$444.22. 20. \$530.19.
21. \$360.25. 22. \$148.60. 23. \$271.31. 24. \$321.91.
25. \$550.11. 26. \$251. 27. \$341.85. 28. \$587.31.
29. \$381.22. 30. \$261.44. 31. \$77.60. 32. \$193.33.
33. \$537.35. 34. \$390.88. 35. \$877.55.

Page 178

1. 8635. 2. 235. 3. 530 ft. 4. 173.
5. 189. 6. \$3540.45. 7. \$3277.25.

Page 179

1. 76 ct. 2. 24 ct., 96 ct. 3. 16 ct., 80 ct.
4. \$3.25. 5. \$24.

Page 180

1. \$1467.50. 2. \$3378.20. 3. \$5890.50.
4. \$2973.76. 5. \$2787.48. 6. \$4824.36.
7. \$6882.92. 8. \$10,780.90. 9. \$8628.75.
10. \$10,974.96. 11. \$12,018.30. 12. \$24,668.75.
13. \$9689.90. 14. \$17,214.44. 15. \$23,919.
16. \$23,949. 17. \$35,432.80. 18. \$28,703.69.
19. \$36,147.06. 20. \$22,528.

Page 181

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|------------------|------------------|------------------|
| 1. \$59,500. | 2. \$99,387. | 3. \$76,109. |
| 4. \$229,402. | 5. \$3332.88. | 6. 98,868. |
| 7. 80,934. | 8. \$1843.75. | 9. \$33,747.20 |
| 10. \$28,988.40. | 11. \$18,047.25. | 12. \$32,322.36. |
| 13. \$42,093.44. | 14. \$22,310.64. | 15. \$30,796.80. |
| 16. \$34,689.75. | 17. \$49,060.08. | 18. \$2543.32. |
| 19. \$7976.50. | 20. \$39,832.56. | 21. \$13,940. |
| 22. \$1425. | 23. \$42. | 24. \$101.25. |
| 25. \$46.08. | 26. \$546. | |

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|---------|----------|----------|---------|-----------|
| 1. 29. | 2. 139. | 3. 222. | 4. 111. | 5. 99. |
| 6. 222. | 7. \$45. | 8. \$21. | 9. 35. | 10. \$11. |

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|------------|------------|------------|------------|-------------|
| 1. \$3.24. | 2. \$2.35. | 3. \$2.17. | 4. \$1.11. | 5. \$27.63. |
| 6. \$3.64. | 7. \$1.35. | 8. \$7.20. | 9. 72 ct. | 10. 38 ct. |

Page 184

- | | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|
| 1. $7\frac{1}{2}$. | 2. $5\frac{1}{8}$. | 3. $7\frac{1}{12}$. | 4. $8\frac{1}{2}$. |
| 5. $9\frac{1}{2}$. | 6. $10\frac{1}{2}$. | 7. $12\frac{1}{2}$. | 8. 15. |
| 9. $45\frac{1}{2}$. | 10. $67\frac{1}{2}$. | 11. $93\frac{1}{2}$. | 12. $89\frac{1}{2}$. |
| 13. $65\frac{1}{11}$. | 14. 39. | 15. $81\frac{1}{11}$. | 16. $67\frac{1}{11}$. |
| 17. $\$2.10\frac{1}{2}$. | 18. $\$3.55\frac{1}{2}$. | 19. $\$4.84\frac{1}{2}$. | 20. $\$3.30\frac{1}{2}$. |
| 21. $\$28.55\frac{1}{2}$. | 22. $\$50.50\frac{1}{2}$. | 23. $\$41.10\frac{1}{2}$. | 24. $\$69.10\frac{1}{2}$. |

Page 185

- | | | | | |
|----------|------------------------|-------------------------|--|-----------------------|
| 1. 101. | 2. 102. | 3. 203. | 4. 203. | 5. 105. |
| 6. 901. | 7. $40\frac{1}{4}$. | 8. $106\frac{1}{4}$. | 9. $909\frac{1}{4}$. | 10. $90\frac{1}{4}$. |
| 11. 102. | 12. $901\frac{1}{2}$. | 13. $31\frac{1}{2}$ ct. | Fractions, as in Ex. 7,
may be replaced by remainders, as 40 and a remainder of 24. | |

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- | | | |
|------------------------|------------------------|-------------|
| 1. $202\frac{1}{11}$. | 2. $146\frac{3}{11}$. | 3. 102. |
| 4. $206\frac{1}{11}$. | 5. $607\frac{1}{11}$. | 6. 147. |
| 7. \$3.50, \$28. | 8. \$15.50. | 9. \$22.50. |

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- | | | | |
|----------------------------|----------------------------|---------------------------|----------------------------|
| 1. 86. | 2. $\$117\frac{1}{2}$. | 3. 1047. | 4. 1040. |
| 5. 1162. | 6. 427. | 7. $4504\frac{1}{2}$. | 8. $1560\frac{1}{2}$. |
| 9. 1430. | 10. 10,487. | 11. 3109. | 12. 6706. |
| 13. $\$12.06\frac{1}{2}$. | 14. $\$14.81\frac{1}{2}$. | 15. $\$8.93\frac{1}{2}$. | 16. $\$43.52\frac{1}{2}$. |
| 17. $\$80.40\frac{1}{2}$. | 18. $\$27.77\frac{1}{2}$. | | |

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- | | | |
|-----------------|----------------|---------------------|
| 1. 16, 495 rem. | 2. 83 ct. | 3. \$36, \$900 rem. |
| 4. \$0.49. | 5. 81 ct. | 6. \$3.21. |
| 7. 75 ct. | 8. 95. | 9. \$7.25. |
| 10. \$7.35. | 11. 50, 85 ct. | 12. \$103.39. |
| 13. \$6.75. | | |

Page 189

- | | | | |
|-------------------------|--------------|-------------|-------------|
| 1. \$8.75. | 2. \$5.02. | 3. \$99. | 4. 64 ct. |
| 5. $16\frac{1}{17}$ ct. | 6. \$2.78. | 7. 87 ct. | 8. \$1.05. |
| 9. 61 ct. | 10. 89 ct. | 11. \$2.01. | 12. \$6.25. |
| 13. \$35.27. | 14. \$10.50. | 15. 65 ct. | 16. 35 ct. |
| 17. \$25.44. | | | |

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- | | | | |
|-------------|-----------|-----------|----------|
| 1. 97. | 2. 360. | 3. 859. | 4. 2254. |
| 5. \$86.54. | 6. \$220. | 7. 88 ct. | |

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- | | | | | |
|----------|-----------|------------|--------------|------------|
| 1. \$93. | 2. \$348. | 3. \$5.80. | 4. \$244.20. | 5. \$2.22. |
|----------|-----------|------------|--------------|------------|

Page 192

1. 19. 2. 3. 3. 29. 4. 20. 5. 32.
6. 60. 7. 75. 8. 20, 28, 44, 48.
9. 24, 30, 45, 60. 10. 27 ct.

Page 194

1. $62\frac{3}{8}$. 2. $12\frac{1}{2}$. 3. $12\frac{1}{2}$. 4. $55\frac{1}{8}$. 5. $12\frac{3}{8}$.
6. $35\frac{1}{2}$. 7. $44\frac{1}{2}$. 8. $6\frac{3}{8}$. 9. $12\frac{3}{8}$. 10. $47\frac{1}{2}$.
11. $17\frac{1}{2}$. 12. $18\frac{3}{8}$.

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3. 6, 9, 3, 15. 4. 8, 16, 4, 20. 5. 15, 20, 5, 25.
6. 12, 24, 6, 30. 7. 21, 14, 7, 6.

Page 197

1. $331\frac{3}{8}$. 2. $1000\frac{7}{8}$. 3. $995\frac{3}{8}$. 4. 12,299.
5. $1464\frac{1}{2}$. 6. $2018\frac{3}{8}$. 7. $1268\frac{3}{8}$. 8. $14,826\frac{3}{8}$.
9. $4400\frac{3}{8}$. 10. $1869\frac{3}{8}$. 11. $7597\frac{7}{8}$. 12. $3404\frac{3}{8}$.
13. $7845\frac{1}{2}$. 14. $3337\frac{1}{2}$. 15. $1273\frac{1}{2}$. 16. $3396\frac{3}{8}$.

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1. 42. 2. 50. 3. 64. 4. 51. 5. 54.
6. 72. 7. 30. 8. 45. 9. 60. 10. 55.
11. 60. 12. 80. 13. 63. 14. 69. 15. 87.
16. 215. 17. 265. 18. 355. 19. 35. 20. 126.
21. 126.

Page 199

1. 329. 2. 572. 3. 1058. 4. 986.
5. 6767. 6. 5041. 7. \$275. 8. \$990.
9. \$630. 10. \$17.60. 11. \$47.15. 12. \$43.86.
13. \$343.75. 14. \$884. 15. \$1034. 16. \$242.50.
17. \$660.38. 18. \$1385.10. 19. \$876.73. 20. \$653.33.
21. \$16.20. 22. \$23.60. 23. \$55.20.

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- | | | |
|-------------|------------|------------|
| 1. \$5.25. | 2. \$2.60. | 3. 91 ct. |
| 4. \$13.76. | 5. \$4.08. | 6. \$7.49. |

Page 201

- | | | |
|------------------------|------------------------|-------------------------|
| 1. 39,483. | 2. 76,648. | 3. 90,750. |
| 4. 92,352. | 5. 74,556. | 6. 78,141. |
| 7. 57,057. | 8. 83,640. | 9. 63,342. |
| 10. 83,809. | 11. 62,624. | 12. 41,808. |
| 13. 54,400. | 14. 68,888. | 15. 92,040. |
| 16. 42,000. | 17. \$1891.98. | 18. \$2290.08. |
| 19. \$5129.25. | 20. \$2882.82. | 21. \$11,813.75. |
| 22. \$22,598.40. | 23. \$23,796.48. | 24. \$40,286.60. |
| 25. 162. | 26. 42. | 27. 48. |
| 28. $87\frac{3}{8}$. | 29. $69\frac{1}{8}$. | 30. $37\frac{3}{8}$. |
| 31. $128\frac{1}{8}$. | 32. $82\frac{1}{8}$. | 33. $206\frac{1}{8}$. |
| 34. 271. | 35. 242. | 36. 203. |
| 37. $302\frac{1}{2}$. | 38. $325\frac{1}{2}$. | 39. $235\frac{1}{2}$. |
| 40. $107\frac{5}{8}$. | 41. $111\frac{1}{8}$. | 42. 3717. |
| 43. 5450. | 44. 4995. | 45. 8211. |
| 46. 5136. | 47. 21,115. | 48. 37,054. |
| 49. 43,332. | 50. 67,039. | 51. $3694\frac{1}{8}$. |

Page 202

- | | | | |
|--------------------------|------------------------|-------------------------|-------------------------|
| 1. 5749. | 2. 2632. | 3. 10. | 4. 9. |
| 5. $2397\frac{1}{8}$. | 6. $4278\frac{1}{8}$. | 7. $2775\frac{3}{4}$. | 8. $6753\frac{1}{2}$. |
| 9. 791. | 10. 5600. | 11. $5726\frac{1}{2}$. | 12. $6385\frac{1}{2}$. |
| 13. $1404\frac{4}{13}$. | 14. 2044. | 15. $541\frac{3}{17}$. | 16. 247. |
| 17. 150. | 18. 332. | 19. 176. | 20. 125. |
| 21. $223\frac{1}{4}$. | 22. $217\frac{5}{8}$. | 23. $359\frac{1}{8}$. | 24. 124. |
| 25. $242\frac{1}{2}$. | 26. $193\frac{1}{8}$. | 27. $169\frac{1}{8}$. | 28. $472\frac{1}{4}$. |
| 29. $144\frac{2}{5}$. | 30. $204\frac{1}{3}$. | 31. 72. | 32. $142\frac{1}{4}$. |
| 33. 395. | 34. 102. | | |

Page 203

- | | | | |
|-------------|--------------|-----------|------------|
| 1. 42 pt. | 2. 8 gal. | 3. 88 pk. | 4. 288 hr. |
| 5. 2350 ct. | 6. 1500 sec. | 7. 28 oz. | 8. 9 min. |

Page 204

- | | |
|-------------------------------|--------------------------------|
| 1. $16\frac{1}{2}$ ft., 1 rd. | 2. 2640 ft., 1320 ft., 660 ft. |
| 3. 160 rd., 80 rd., 40 rd. | 4. 36 in., 198 in., 63,360 in. |
| 5. 2 mi., 17 mi. | 6. 264 yd., 355 yd. |

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- | | |
|------------------------------------|--------------------------|
| 1. 98 ft., 558 sq. ft. | 2. 174 ft., 1850 sq. ft. |
| 3. $38\frac{3}{4}$ ft., 65 sq. ft. | 4. 540 sq. in. |
| 5. 423 sq. yd. | 6. 372 sq. ft. |

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- | | |
|---------------------------|----------------------------|
| 2. 60 sq. in., 30 sq. in. | 4. $49\frac{1}{2}$ sq. in. |
|---------------------------|----------------------------|

Page 207

- | | | | |
|--------------|----------------|-----------------|----------------|
| 1. 3 cu. ft. | 2. 128 cu. in. | 3. 1105 cu. in. | 4. 168 cu. yd. |
|--------------|----------------|-----------------|----------------|

Page 209

- | | |
|-------------------|-------------------------|
| 1. 3025 sq. ft. | 2. $185\frac{1}{2}$ yd. |
| 3. 29,700 sq. ft. | 4. 118,800 sq. ft. |
| 5. 30,250 cu. yd. | 6. 60,500 tons. |

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- | | | |
|------------------|-------------------|------------------|
| 1. 47 ft. 8 in. | 2. 54 yd. 2 in. | 3. 83 gal. 1 qt. |
| 4. 228 ft. 6 in. | 5. 288 yd. | 6. 231 bu. 1 pk. |
| 7. 189 lb. 9 oz. | 8. 285 yd. 31 in. | 9. 199 lb. 7 oz. |

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- | | | |
|-----------------------|-------------------|------------------------------|
| 1. 13 ft. 8 in. | 2. 3 yd. 23 in. | 3. 111 ft. 10 in. |
| 4. 105 gal. 3 qt. | 5. 6 mi. 4380 ft. | 6. 1 mi., $5\frac{1}{4}$ mi. |
| 7. $6\frac{3}{4}$ mi. | | |

Page 212

- | | | |
|-----------------|-------------------|-------------------|
| 1. 900 sq. in. | 4. 2736 sq. in. | 5. 4558 sq. in. |
| 6. 1536 sq. in. | 7. 23,864 sq. in. | 8. 62,568 sq. in. |
| 9. 6192 sq. in. | | |

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- | | |
|--|---------------------------------|
| 10. 6,000,275. | 11. 20,020, 2,000,202, 300,333. |
| 12. 5280, 52,800, 528,000, 1,056,000. | |
| 13. 60, 3600, 86,400, 31,536,000, 315,360,000. | |

Page 215

- | | | |
|--------------|------------------|------------------|
| 1. \$453.40. | 2. 557 lb. 3 oz. | 3. 586 ft. 4 in. |
|--------------|------------------|------------------|

Page 216

- | | | |
|-------------------------------|-----------|-----------------------------|
| 1. 11 lb. 8 oz. | 2. 6 ct. | 3. $\frac{3}{4}$ lb., 6 ct. |
| 4. $1\frac{1}{2}$ qt., 10 ct. | 5. 40 ct. | |

Page 217

- | | | |
|------------------|-------------------|-----------------|
| 1. 3 ft. 11 in. | 2. 1 lb. 14 oz. | 3. 3 gal. 3 qt. |
| 4. 3 bu. 3 pk. | 5. \$287.88. | 6. \$614.85. |
| 7. 113 lb. 6 oz. | 8. 107 lb. 12 oz. | |

Page 218

- | | | | |
|--------------|---------------|---------------|-----------------|
| 1. \$85,260. | 2. \$238,924. | 3. \$450,452. | 4. \$1,087,750. |
| 5. \$324. | 6. \$999.96. | 7. \$56.33, | \$675.96. |

Page 219

- | | | |
|-----------------|------------------|-------------------|
| 1. \$720,790. | 2. \$1,219,624. | 3. \$8937.50. |
| 4. \$8864.25. | 5. \$12,900.80. | 6. \$22,120. |
| 7. \$62,723.25. | 8. \$122,173.92. | 9. \$5200. |
| 10. \$5200. | 11. \$5200. | 12. \$5200. |
| 13. \$12,040. | 14. \$16,666.25. | 15. \$343,203.12. |

Page 220

- | | | |
|------------------|------------------|------------------|
| 1. \$2500. | 2. \$4950. | 3. \$33,775. |
| 4. \$31,250. | 5. \$29,400. | 6. \$26,415. |
| 7. \$114,300. | 8. \$493,980. | 9. \$196,206. |
| 10. \$3,195,135. | 11. \$2,282,175. | 12. \$1,268,547. |

Page 221

- | | |
|-----------|------------|
| 1. 90 ct. | 2. \$4.10. |
|-----------|------------|

Page 222

3. \$3.

Page 223

1. $\frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}$. 2. $\frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}$.
 3. $\frac{2}{3}, \frac{2}{3}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}$.

Page 224

1. $\frac{1}{8}$. 2. $\frac{1}{8}$. 3. $\frac{1}{8}$. 4. $\frac{1}{8}$. 5. $\frac{1}{8}$. 6. $\frac{1}{8}$.
 7. $\frac{1}{8}$. 8. $\frac{1}{8}$. 9. $\frac{1}{8}$. 10. $\frac{1}{8}$. 11. $\frac{1}{8}$. 12. $\frac{1}{8}$.
 13. $\frac{1}{8}$. 14. $\frac{1}{8}$. 15. $\frac{1}{8}$. 16. $\frac{1}{8}$.

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1. 12. 2. 32. 3. 37. 4. 15. 5. 12. 6. 12.
 7. $11\frac{1}{2}$. 8. $8\frac{1}{2}$. 9. $9\frac{1}{2}$. 10. $56\frac{1}{2}$. 11. $12\frac{1}{2}$. 12. $18\frac{1}{2}$.
 13. 16. 14. $12\frac{1}{2}$. 15. $8\frac{1}{2}$. 16. $10\frac{1}{2}$. 17. $6\frac{1}{2}$. 18. $4\frac{1}{2}$.

Page 226

- | | | | |
|----------|----------|--------|--------|
| 1. 1230. | 3. 5600. | 5. 48. | 7. 12. |
|----------|----------|--------|--------|

Page 227

- | | | | | |
|------------|------------|-------------|----------|------------|
| 1. 15,665. | 2. 9675. | 3. 183,850. | 4. 1414. | 5. 336. |
| 6. 1248. | 7. \$7.35. | 8. \$36.75. | 9. \$86. | 10. \$284. |

Page 228

- | | | | |
|----------------------|-------------------------|------------------------|----------------------|
| 1. $\frac{1}{8}$. | 2. $1\frac{7}{8}$. | 3. $\frac{9}{10}$. | 4. $7\frac{1}{2}$. |
| 5. $8\frac{7}{8}$. | 6. $7\frac{1}{2}$. | 7. $7\frac{1}{8}$. | 8. $5\frac{3}{10}$. |
| 9. $14\frac{1}{2}$. | 10. $\$20\frac{1}{4}$. | 11. $111\frac{7}{8}$. | |

Page 229

- | | | | |
|-----------------------|-----------------------|-------------------------|-----------------------|
| 1. $18\frac{1}{2}$. | 2. $553\frac{7}{8}$. | 3. $766\frac{3}{4}$. | 4. $22\frac{1}{2}$. |
| 5. $12\frac{3}{4}$. | 6. $1\frac{1}{2}$. | 7. $199\frac{3}{4}$. | 8. $190\frac{1}{2}$. |
| 9. $26\frac{9}{14}$. | 10. $\$12.25$. | 11. $\$13\frac{3}{4}$. | |

Page 231

- | | | | | | |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 4. $\frac{1}{8}$. | 5. $\frac{1}{4}$. | 6. $\frac{1}{8}$. | 7. $\frac{1}{4}$. | 8. $\frac{3}{8}$. | 9. $\frac{1}{8}$. |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|

Page 234

- | | | | | |
|--------------|-----------------|--------------|--------------|--------------|
| 1. $\$170$. | 2. $\$177.60$. | 3. $\$375$. | 4. $\$128$. | 5. $\$165$. |
|--------------|-----------------|--------------|--------------|--------------|

Page 235

- | | | | |
|------------------------|---------------|-----------|---------------|
| 1. $87\frac{1}{2}$ ct. | 2. $\$1.05$. | 3. 95 ct. | 4. $\$1.20$. |
|------------------------|---------------|-----------|---------------|

Page 236

- | | | |
|-------------------------|-------------------------|------------------------|
| 1. $9\frac{1}{8}$. | 2. $16\frac{3}{4}$. | 3. $5\frac{3}{10}$. |
| 4. $\$9\frac{1}{4}$. | 5. $\$13\frac{7}{8}$. | 6. $\$12\frac{1}{4}$. |
| 7. $45\frac{3}{8}$. | 8. $12\frac{7}{8}$. | 9. $25\frac{3}{8}$. |
| 10. $8\frac{3}{10}$. | 11. $18\frac{1}{2}$. | 12. $26\frac{3}{4}$. |
| 13. $3\frac{1}{2}$ in. | 14. $2\frac{1}{2}$ ft. | 15. $3\frac{3}{4}$ in. |
| 16. $41\frac{1}{2}$ lb. | 17. $5\frac{1}{8}$ doz. | 18. 50 ct. |
| 19. 75 ct. | 20. $\$6$. | 21. 12, 36. |
| 22. 12, 48. | 23. 7, 35. | 24. 6, 12. |
| 25. 8, 24. | 26. 3, 15. | 27. 30 in., 40 in. |
| 28. $\$14$, $\$18$. | 29. 45 yd., 60 rd. | 30. 21 ft., 45 in. |
| 31. 105 ft. | 32. $10\frac{1}{2}$ qt. | 33. 68 yd. |

Pages 238, 239

1. 95 ct. 2. \$2.47. 3. \$3. 4. \$18.30. 5. \$5.87.

Page 240

- | | | | |
|-------------|-------------|-------------|-------------|
| 1. \$1.25. | 2. 58¢. | 3. 84¢. | 4. 48¢. |
| 5. 88¢. | 6. \$1.08. | 7. 22¢. | 8. 20¢. |
| 9. 75¢. | 10. 36¢. | 11. 24¢. | 12. 55¢. |
| 13. 30¢. | 14. \$3. | 15. 35¢. | 16. 55¢. |
| 17. \$1.72. | 18. 21¢. | 19. 63¢. | 20. \$1.34. |
| 21. 76¢. | 22. 60¢. | 23. \$1.50. | 24. \$1.60. |
| 25. 56¢. | 26. 63¢. | 27. 33¢. | 28. \$1.20. |
| 29. \$2.10. | 30. 25¢. | 31. 49¢. | 32. 31½¢. |
| 33. \$1.02. | 34. \$1.75. | 35. 24¢. | 36. 88¢. |
| 37. 57½¢. | 38. 36¢. | | |

Page 241

1. \$3.77. 2. 21 ct.

Page 244

- | | |
|----------------------------|--------------------------------|
| 1. 0.3, 0.5, 0.2, 0.6. | 2. 0.03, 0.05, 0.07, 0.23. |
| 3. 0.47, 0.62, 0.54, 0.75. | 4. 0.245, 0.625, 0.482, 0.003. |
| 5. 1.6, 3.5, 7.2, 9.6. | 6. 1.32, 4.752, \$6.75. |

Page 245

1. $\frac{2}{10}$, 0.2; $\frac{5}{10}$, 0.5. 2. 0.7, 0.6, 0.8, 0.9, 0.1.
3. $\frac{1}{10}$, $\frac{1}{5}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$.

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- | | | | | |
|-----------|------------|-------------|-----------|-----------|
| 1. 13.05. | 2. 23.95. | 3. 94.72. | 4. 19.04. | 5. 13.20. |
| 6. 22.30. | 7. 221.15. | 8. 355.325. | 9. 9 ft. | |

Page 247

1. \$80. 2. \$225. 3. \$43.75. 4. \$62.50. 5. \$127.50.
6. \$210. 7. 100 boys. 8. 21 lost. 9. 3.

Page 248

5. \$75.60.

6. \$6.40.

Page 249

1. 2800 sq. rd.

2. 27,520 A., 64,000 A.

3. 3 A.

Page 250

1. 5,000,000,000 lb. 2. \$500,000,000.

3. 3,500,000 bales. 4. 2,000,000 bales, 1,000,000,000 lb.

Page 251

2. $\frac{1}{2}$ bu.3. $\frac{3}{4}$ bu.4. $1\frac{1}{2}$ bu.

Page 252

1. 5 A.

2. \$1875.

3. 10.

4. 264 ft., $82\frac{1}{2}$ ft., 21,780 sq. ft., $\frac{1}{2}$ A.

5. \$1375.

6. \$166.50.

7. \$4500, including furniture. 8. 6 yr. 9. \$39.60.

Page 253

1. $22\frac{1}{2}$ yd.

2. \$2.70.

3. \$1.75, \$2.05.

4. 25 ct.

5. \$3.10.

6. \$1.50.

7. $73\frac{1}{2}$ ct.8. $\$10.33\frac{1}{2}$, or \$10.34.

Page 254

4. 20 yd. matting, \$9.60; 20 yd. Brussels carpet, \$13;
 26 $\frac{3}{4}$ yd. velvet carpet, \$29.33; but it would really
 take 6 breadths one way or 7 the other, costing
 \$30.80 or \$33.

Page 255

1. 265,992.4 mi.

2. 1,589,160.

3. 1,628,640.

4. 137.

5. \$1046.10.

Page 256

1. 1776 mi. 2. \$194.50. 3. \$30. 4. 485.5 T., 5826 T.

Page 257

- | | | |
|---------------------|------------------------|----------------------------|
| 1. 34.01. | 2. 150. | 3. 30.63. |
| 4. \$5.82. | 5. 70.04. | 6. 10 ft. |
| 7. 10. | 8. 7 ft. 11 in. | 9. 17.32 in. |
| 10. 310.1 ft. | 11. $65\frac{1}{2}$ A. | 12. 122.82 in. |
| 13. \$37.50. | 14. \$80. | 15. \$140. |
| 16. \$123. | 17. \$309. | 18. \$370. |
| 19. \$2262. | 20. \$110. | 21. 296 in. |
| 22. \$475. | 23. 390 yd. | 24. 300 sq. rd. |
| 25. 375 cu. in. | 26. 648 cu. in. | 27. 59.18 sq. ft. |
| 28. 68.75 mi. | 29. 33.07 yd. | 30. 20.75 mi. |
| 31. 1275.73 sq. in. | 32. 9.37 in. | 33. 24 yd. |
| 34. 20.55 mi. | 35. 238.34 cu. ft. | 36. 90¢. |
| 37. \$1.35. | 38. \$4.50. | 39. \$6.66 $\frac{2}{3}$. |
| 40. 45¢. | 41. \$1.89. | 42. 84¢. |

Page 258

1. $\frac{1}{20}$, 0.05. 2. 0.25, 25%. 3. $\frac{1}{2}$, 50%.

Page 260

- | | | | |
|----------------|------------------------|------------------------|----------------|
| 1. \$21.25. | 2. \$45. | 3. \$7.50. | 4. \$32. |
| 5. \$22.20. | 6. \$33.60. | 7. \$27.50. | 8. \$66. |
| 9. \$32.50. | 10. \$50. | 11. 15. | 12. 5. |
| 13. 110 girls. | 14. $1\frac{1}{2}$ ft. | 15. $7\frac{1}{2}$ ft. | 16. 82, 41, 9. |

Page 261

- | | | |
|-----------------------|--------------------|-----------------|
| 1. \$62.50, \$187.50. | 2. \$48, \$272. | 3. \$55, \$385. |
| 4. \$74.25, \$150.75. | 5. \$2.40, \$9.60. | 6. \$10, \$20. |

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- 1. \$18. 2. \$40. 3. \$2.50. 4. \$45.**

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1. \$40. 2. \$42. 3. \$30. 4. \$30.
5. \$4.50. 6. \$2.50. 7. \$1.50. 8. \$2.
9. \$6.25. 10. \$1.50. 11. \$1.25. 12. \$8.

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- | | | | |
|--|----------------------------|-----------------------------|-------------------------|
| 1. 831.4. | 2. 6833. | 3. 3609. | 4. 4275. |
| 5. \$4007.50. | 6. \$465.75. | 7. $78\frac{3}{4}$ ft. | 8. $535\frac{1}{2}$ yd. |
| 9. 32,736. | 10. 2,021,250. | 11. 241,500. | 12. 720. |
| 13. 39,330. | 14. 33,611. | 15. \$2628. | 16. \$962. |
| 17. 17. | 18. \$0.60. | 19. 23. | 20. 13. |
| 21. 22.5. | 22. 31.5. | 23. \$0.05. | 24. \$4.20. |
| 25. $1\frac{1}{2}$ ft. | 26. 111. | 27. \$11.12 $\frac{1}{2}$. | 28. 101. |
| 29. 101. | 30. $3\frac{1}{2}$ cu. in. | 31. $\frac{1}{2}$ ft. | 32. $\frac{2}{5}$. |
| 33. $\frac{1}{2}$ ft. | 34. $\frac{1}{10}$. | 35. $1\frac{2}{5}$. | 36. $\frac{3}{4}$. |
| 37. $\frac{1}{8}$. | 38. $\frac{3}{8}$. | 39. $\frac{5}{8}$. | 40. $\frac{7}{8}$. |
| 41. 0.6. | 42. 0.8. | 43. 0.6. | 44. 0.9. |
| 45. $0.33\frac{1}{3}$. | 46. 2.2. | 47. 3.4. | 48. 5.07. |
| 49. 7.02. | 50. 9.02. | | |
| 51. \$38.40, \$28, \$52, \$72, \$192, \$412. | | | |
| 52. \$12, \$18.50. | | | |

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- | | | | | |
|------------------------|--------------------------|--------------------------|------------------------|--------------------------|
| 1. $\frac{37}{100}$. | 2. $\frac{13}{100}$. | 3. $\frac{333}{1000}$. | 4. $\frac{79}{100}$. | 5. $\frac{2}{100}$. |
| 6. $\frac{3}{100}$. | 7. $\frac{1}{100}$. | 8. $\frac{3}{100}$. | 9. $\frac{4}{100}$. | 10. $\frac{7}{100}$. |
| 11. $\frac{83}{100}$. | 12. $\frac{100}{100}$. | 13. $\frac{175}{1000}$. | 14. $\frac{1}{100}$. | 15. $\frac{1}{100}$. |
| 16. $\frac{7}{100}$. | 17. $\frac{333}{1000}$. | 18. $\frac{333}{1000}$. | 19. $\frac{75}{100}$. | 20. $\frac{155}{1000}$. |
| 21. 23%. | 22. 42%. | 23. 75%. | 24. 62%. | 25. 41%. |
| 26. 20%. | 27. 30%. | 28. 50%. | 29. 70%. | 30. 80%. |
| 31. 25%. | 32. 33 $\frac{1}{3}$ %. | 33. 52%. | 34. 75%. | 35. 82%. |

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1. 1, 38, 55, 50, 4, 20, 30.
2. 10, 21, 26, 33, 3, 42, 53.
3. 42, 10, 3, 4, 20, 56, 33.
4. 75, 1, 2, 16, 30, 34, 10.
5. 45, 13, 31, 45, 14, 10, 20.
6. 11, 48, 56, 53, 4, 52, 63.
7. 42, 21, 28, 34, 23, 66, 53.
8. 85, 11, 3, 19, 30, 66, 43.
9. 77, 13, 33, 46, 34, 34, 20.
10. 43, 48, 58, 54, 24, 76, 63.
11. 85, 22, 28, 49, 33, 76, 63.
12. 87, 23, 34, 49, 34, 66, 53.
13. 86, 49, 58, 69, 34, 86, 73.
14. 87, 34, 59, 79, 37, 76, 73.
15. 88, 61, 89, 99, 38, 86, 83.

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1. 11, 2, 10, 11, 30, 11, 2.
2. 2, 12, 11, 22, 1, 10, 11.
3. 11, 11, 14, 2, 2, 2, 3.
4. 11, 21, 11, 11, 10, 2, 2.
5. 3, 10, 20, 5, 1, 1, 2.
6. 20, 0, 10, 7, 3, 1, 2.
7. 13, 14, 21, 33, 31, 21, 13.
8. 24, 25, 35, 35, 33, 23, 16.
9. 35, 46, 46, 46, 43, 25, 18.
10. 38, 56, 66, 51, 44, 26, 20.
11. 12, 3, 13, 13, 23, 30, 10.
12. 0, 8, 7, 10, 0, 10, 20.
13. 20, 21, 32, 20, 20, 5, 2.
14. 12, 31, 10, 10, 9, 5, 1.
15. 22, 3, 12, 12, 4, 4, 2.
16. 10, 1, 2, 3, 3, 4, 5.
17. 12, 11, 20, 23, 23, 40, 30.
18. 32, 32, 52, 43, 43, 45, 32.
19. 44, 63, 62, 53, 52, 50, 33.

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1. 68 ft.
2. 5, 10, 13.
4. 43.
5. 74 mi.
6. 22.
7. 30.
8. 23 ct.
9. 66 ct.
10. 48 ct.
11. 6.

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1. \$560.
2. 680 yd.
3. 703 ft.
4. 615 in.
5. \$730.
6. \$702.
7. 800 yd.
8. 766 ft.
9. 888 in.
10. \$779.
11. 916.
12. 912.
13. 983.
14. 737.
15. 885.
16. 740.
17. 777.
18. 918.
19. 687.
20. 688.
21. \$865.
22. \$744.
23. \$578.
24. \$852.
25. \$755.

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| | | | |
|-------------|-------------|-------------|-------------|
| 1. 107. | 2. 69. | 3. 146. | 4. 198. |
| 5. 208. | 6. 148. | 7. 172. | 8. 118. |
| 9. 189. | 10. 99. | 11. 323. | 12. 70. |
| 13. 429. | 14. 203. | 15. 565. | 16. 364. |
| 17. 505. | 18. 575. | 19. 367. | 20. 189. |
| 21. \$148. | 22. \$39. | 23. \$174. | 24. \$41. |
| 25. \$91. | 26. \$125. | 27. \$365. | 28. \$108. |
| 29. 355 ft. | 30. 94 ft. | 31. 114 yd. | 32. 818 ft. |
| 33. 99 bu. | 34. 139 bu. | 35. 85 ft. | 36. 248 bu. |
| 37. 383 ft. | 38. 284 ft. | 39. 130 ft. | 40. 171 ft. |

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|----------|----------|----------|----------|----------|----------|
| 1. 64. | 2. 87. | 3. 188. | 4. 265. | 5. 260. | 6. 305. |
| 7. 248. | 8. 78. | 9. 72. | 10. 252. | 11. 330. | 12. 438. |
| 13. 135. | 14. 252. | 15. 162. | 16. 90. | 17. 172. | 18. 195. |

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| | | | | | |
|----------|---------|---------|----------|----------|----------|
| 1. 160. | 2. 98. | 3. 228. | 4. 232. | 5. 95. | 6. 410. |
| 7. 108. | 8. 165. | 9. 94. | 10. 258. | 11. 145. | 12. 192. |
| 13. 192. | 14. 87. | 15. 76. | 16. 176. | 17. 115. | 18. 117. |

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| | | | | | |
|----------|----------|----------|----------|----------|----------|
| 1. 112. | 2. 111. | 3. 312. | 4. 111. | 5. 123. | 6. 211. |
| 7. 212. | 8. 403. | 9. 201. | 10. 100. | 11. 233. | 12. 104. |
| 13. 102. | 14. 210. | 15. 412. | 16. 222. | 17. 23. | 18. 110. |
| 19. 101. | 20. 121. | 21. 32. | | | |

Pages 276, 277

| | | | | |
|----------|----------|----------|----------|-----------|
| 1. 255. | 2. 337. | 3. 264. | 4. 257. | 5. 366. |
| 6. 3149. | 7. 3236. | 8. 3704. | 9. 4153. | 10. 2503. |

| | | |
|----------------|----------------|----------------|
| 11. \$475.19. | 12. \$938.38. | 13. \$952.49. |
| 14. \$692.55. | 15. \$581.53. | 16. \$747.24. |
| 17. \$1949.37. | 18. \$1912.99. | 19. \$1190.72. |
| 20. \$1401.02. | 21. \$1078.82. | 22. \$4750.97. |

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| | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|
| 1. $205\frac{3}{4}$. | 2. $252\frac{1}{4}$. | 3. $995\frac{1}{3}$. | 4. $920\frac{1}{2}$. |
| 5. $1666\frac{1}{2}$. | 6. $316\frac{1}{4}$. | 7. $1642\frac{3}{8}$. | 8. $701\frac{3}{4}$. |
| 9. $302\frac{7}{8}$. | 10. $448\frac{3}{4}$. | 11. $897\frac{7}{8}$. | 12. 355. |
| 13. 507. | 14. $364\frac{1}{2}$. | 15. $398\frac{3}{4}$. | 16. $904\frac{3}{4}$. |
| 17. $236\frac{3}{4}$. | 18. $293\frac{1}{2}$. | 19. $908\frac{3}{8}$. | 20. $1180\frac{3}{4}$. |
| 21. $1333\frac{1}{2}$. | 22. $585\frac{3}{4}$. | 23. $888\frac{3}{4}$. | 24. 667. |
| 25. $440\frac{3}{4}$. | 26. 1620. | 27. $3888\frac{1}{2}$. | 28. $1335\frac{3}{4}$. |
| 29. $1843\frac{1}{4}$. | 30. $1139\frac{7}{8}$. | 31. $1008\frac{3}{8}$. | 32. $825\frac{3}{4}$. |

Pages 279, 280

| | | |
|----------------------|-------------------|-------------------|
| 1. 72 ct., 28 ct. | 2. \$1.04. | 3. 80 ct., 20 ct. |
| 4. 32 ct., 18 ct. | 5. 69 ct., 46 ct. | 6. 15 ct. |
| 7. \$1.45, \$3.55. | 8. 25 ct. | 9. 25 ct. |
| 10. 35. | 11. \$15. | 12. \$224. |
| 13. \$216. | 14. 264 ft. | 15. 35. |
| 16. The second, \$6. | 17. 126. | 18. 39. |
| 19. \$32, \$192. | 20. \$46.45. | |

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| | | |
|---------------|---------------|-------------|
| 1. \$96. | 2. \$40.25. | 3. 1136 ft. |
| 4. 175 bu. | 5. \$1822.80. | 6. 5. |
| 7. \$302,250. | 8. \$3772. | 9. 1347. |
| 10. \$17.45. | | |

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| | | |
|------------|--------------|-----------|
| 1. \$936. | 2. 1334 bu. | 3. 46 ct. |
| 4. \$2.25. | 5. \$26.80. | 6. \$15. |
| 7. 92. | 8. \$104.07. | 9. 8 hr. |

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|-----------------|----------------|-------------|
| 1. 1536 cu. ft. | 2. 12 cd. | 3. \$90.75. |
| 4. 972. | 5. 216 sq. ft. | 6. \$71.25. |

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|--------------------|------------------------|-----------------------|
| 1. \$3, \$4. | 2. \$102, \$204. | 3. \$600, \$480. |
| 4. \$10, \$9. | 5. 8 $\frac{1}{2}$. | 6. 2 $\frac{3}{4}$. |
| 7. $\frac{1}{2}$. | 8. 173 $\frac{1}{3}$. | 9. 14 $\frac{1}{8}$. |

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|---|---|---|----------------|
| 1. 0.4, or .4. | 2. 0.2, or .2. | 3. 0.5, or .5. | 4. 0.7, or .7. |
| 5. 0.3. | 6. 0.5. | 7. 0.7. | 8. 0.25. |
| 9. 0.07. | 10. 2.5. | 11. 3.75. | 12. 3.7, 0.8. |
| 13. 42.42. | 14. 3.75, 0.99. | 15. 300.75, 0.05. | |
| 16. 0.375. | 17. 4.5, 7.5, 0.85, 0.55. | 18. 300.075. | |
| 19. 6.5, 6.5, 6.5, 6.5. | 20. 0.515, 500.015. | | |
| 21. 7072 bu. | 22. 107.68 ft. | 23. \$1627.50. | 24. 54.17 lb. |
| 25. 490.82 mi. | 26. 15. | 27. 33.3. | 28. 33.6. |
| 29. 220. | 30. 196.2. | 31. 216. | 32. 5.29. |
| 33. 15.96. | 34. 21.06. | 35. 96.48. | 36. 208.98. |
| 37. 262.7. | 38. 136.8. | 39. 193.44. | 40. 251.79. |
| 41. 281.86. | 42. 468.66. | 43. 269.41. | 44. \$1.10. |
| 45. 87 ct. | 46. 90 ct. | 47. 62 ct. | 48. 60 ct. |
| 49. \$3.27. | 50. 81 ct. | 51. 77 ct. | 52. 28 ct. |
| 53. \$1.02. | 54. $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$. | 55. $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$. | |
| 56. $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$. | 57. $\frac{1}{10}$, $\frac{1}{24}$, $\frac{1}{35}$, $\frac{1}{36}$. | 58. $\frac{1}{10}$, $\frac{1}{12}$, $\frac{1}{16}$. | |
| 59. $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$. | 60. \$690, \$1725, \$1581.25. | | |
| 61. 52 ft. 9 in. | 62. 18 cd. | 63. 3300 sq. in. | |

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|--------------|--------------|---------------------------|--------------|
| 1. \$408. | 2. \$717. | 3. \$455. | 4. \$192.50. |
| 5. \$164. | 6. \$143.64. | 7. \$138. | 8. \$246. |
| 9. \$19. | 10. \$29. | 11. 70 $\frac{1}{2}$ ct., | 12. \$1.32. |
| 13. \$12.26. | 14. \$5.20. | or 71 ct. | 15. 8125 lb. |

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12

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